

# Organisational Learning in a traditional rural Context

*A Case Study at Lumwana Mine in Zambia*

by

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at Stellenbosch University

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**March 2016**

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**Date: March 2016**

## **OPSOMMING**

Die tesis ondersoek sisteem kwaliteit in die konteks van Lumwana myn in verre Wes-Zambia.

Die navorsing is gebaseer op Marsick en Watkins se DLOQ model, Rostow se moderniseringsteorie en Delone en Mclean se Informasiesisteem sukses model.

Na diepgaande empiriese analise kom die tesis tot die gevolgtrekking tegnologieaanvaarding is suksesvol en dat dit positief uitwerk op informasiekwaliteit.

## **SUMMARY**

The thesis investigates the relationship between the learning organisation culture and information systems quality. The research is based on the seven dimensions of the learning organisation as per the Marsick and Watkins DLOQ model, Rostow's modernisation theory and the three information systems quality measures derived from Delone and Mclean's Information Systems Success Model. The Lumwana mine in Zambia which is situated in deep rural Africa society was used as a case study for this thesis

Chapter 1 provides the background, research aims and objectives of the thesis

In Chapter 2, the context of Lumwana mine which is situated in a traditional rural area in the Kalumbila district, in North Western Zambia is described.

Chapter 3 focuses on various theoretical frameworks used to interpret the data.

Chapter 4 discusses the qualitative and quantitative methods used in research for the thesis. It also deals with ethical research issues.

In Chapter 5 the quantitative findings are presented by means of descriptive and structured equation modelling tables using SmartPLS software.

In Chapter 6 the implications and applications of the research are discussed. After analysis of the survey results and testing of the secondary and main hypotheses tests, there is a strong significance between the dependent and independent variables.

The thesis comes to the conclusion that despite people in the Lumwana rural area coming from a background where they are technologically starved, technology acceptance is positive. As a result, the learning organisation culture at Lumwana mine positively impacts on information systems quality.

## **ACKNOWLEDGEMENTS**

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## Acronyms and abbreviations

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CL	Continuous Learning
DLOQ	Dimensions of learning organisations questionnaire
D & M	Delone and Mclean
EFA	Exploratory Factor Analysis
EOU	Ease of Use
ERP	Enterprise Resource Planning System
ES	Embedded System
GFI	Goodness of fit index
HRD	Human Resource and Development
ID	Inquiry and Dialogue
IFI	Incremental Fit Index
IMT	Information Management Technology
IS	Information Systems
LER	Local Employment Register
LMC	Lumwana Mine Company
MFEZ	Multi-facility Economic Zone
MIS	Management Information Systems
OSAM	Online Shopping Acceptance Model
PLS	Partial Least Squares

RMSEA	Root Mean Square Error of Approximation
RMR	Root Mean Squared Residuals
SC	System Connection
SEM	Structured Equation Modelling
SeQ	Service Quality
SQ	System Quality
TAM	Technology Acceptance Model
TAM-TPB	Technology Acceptance Model and Theory of Planned Behaviour
TL	Team Learning
TLI	Tucker-Lewis Index
TRA	Theory of Reasoned Action
UTAUT	Unified Theory of Acceptance and Use of Technology

# Chapter 1

## Information Quality and traditional rural Society

### 1.1. Introduction

The researcher of this thesis examined organisational learning in a traditional context by investigating the link between a learning organisation culture and information systems quality in a mining company operating in deep traditional and rural Africa. This was done by examining the Rostow<sup>1</sup> modernisation theory, the Davis' <sup>2</sup> technology acceptance model, and particularly the Watkins and Marsik's <sup>3</sup> model of the learning organisation and information systems quality measures derived from the information systems success model put forth by DeLone and Mclean. <sup>4</sup>

Today most of rural Africa remains underdeveloped. Deep rural Africa in this context refers to parts of Africa that are mostly traditional societies <sup>5</sup>and rely on agriculture, using traditional methods, as a major source of livelihood. In these parts of Africa, there are no major developments in infrastructure and technology. The schools are not easily accessible due to long distances. The quality of education delivery is below average as most schools lack modern education facilities. These environments are far from towns or cities. The

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1 Rostow, W. W. (1960). Stages of economic growth: a non-communist manifesto. Cambridge U.P.

2 Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

3 Marsick, V.J. and Watkins, K.E., 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire. *Advances in Developing Human Resources*, 5(2): 132-151

4 DeLone, W.H. and McLean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems*.19 (4): 9-30

5 Rostow, W. W. (1960). Stages of economic growth: a non-communist manifesto. Cambridge U.P.

majority of the population can hardly read or write. The society is hierarchical. The chiefs and their indunas or sub-chiefs play a major role in the administration of the society's political system.

Despite the above mentioned challenges, some of these areas located in rural Africa have great natural resources such as virgin land, mineral deposits etc. For this reason, world class mining companies conduct explorations and where the feasibility studies are positive and can be funded, they go ahead and build mining operations in such environments. Most of these mines have corporate social responsibility programmes that ensure social sustainability development in the areas they are operating from. The major part of such programmes is local employment.

Mining is a sophisticated operation which requires advanced engineering and knowledge in order to achieve higher results. Most of the mines constructed in the 21<sup>st</sup> century use state of the art technology. This is part of the organisation's strategy to adapt and grow in this knowledge economy where there is a rapid changing business environment with evolution of technology, competition, and innovation.<sup>6</sup> Leitch et al suggested that the survival of many organisations is dependent on how they adapt to technology and embrace learning as part of their culture.<sup>7</sup>

As stated previously, mining operations in deep rural Africa employ the majority of staff from the local communities as part of a social sustainable development programme. Given that the majority of these employees have education from surrounding schools where little or no technology learning takes place, a challenge exists in adopting new technology which they have to use in one way or the other whilst they work in these mining operations.

Many different studies, mostly in developed countries have been done regarding technology adoption, learning organisations and the application of information systems success models. Examples of such studies include research by Marsick and Watkins who argued that learning organisations are key to ensuring individual, team and organisational learning.<sup>8</sup> Marsick and Watkins further contended that learning occurs in all firms but that learning organisations are

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6 Egan, T.M., Yang, B. and Bartlett, K.R., 2004. The effects of organizational learning culture and job satisfaction on motivation to transfer learning and turnover intention. *Human Resource Development Quarterly*, 15(3): 279-301

7 Leitch, C., Harrison, R., Burgoyne, J. and Blanter, C., 1996. Learning organizations: the measurement of company performance.

8 Marsick, Victoria J., Watkins, Karen E., 1999. Looking Again at Learning in the Learning Organization: A Tool that Can Turn into a Weapon! *Learning Organization*, 6(5), pp. 207-11

typified by positive involvements to develop, gather, store, share and employ learning at the systems point so as to develop creative goods and services.<sup>9</sup>

Further, Baker et al<sup>10</sup> explained that a learning organisation culture promotes individual, team and organisational learning and this results in improved performance. Gorla et al<sup>11</sup> developed the link between information systems (IS) quality and organisational impact. Other studies have been done with regard to a learning organisation (or organisational learning) and the impact on organisation performance.

Research studies analysing information systems success models in general and information systems quality in particular comprise of an analysis of Reeves and Bednar's structure of quality which according to Burton is modern technology that supports the industry's "best practice" software criteria, and provides error-free.<sup>12</sup>

According to Gorla et al, information system quality techniques including system quality, information quality, and service quality are altered from the DeLone and McLean IS success model.<sup>13</sup> DeLone and McLean, who are proponents of information system success, argued that it is a complicated notion that includes quality techniques (system and information quality), attitudinal results (application and contentment), and performance-linked results (distinct and institutional influences).<sup>14</sup>

The link between information systems' quality and organisational impact was modelled by Gorla et al.<sup>15</sup> Their inferences indicated that IS service quality is the variable with the biggest impact in this model (subsequent to which are information quality and system quality), thereby outlining the significance of IS service quality for institutional performance. This was conducted in Hong Kong and it was suggested that there was a requirement for cross-cultural

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9 Marsick, V.J. and Watkins, K.E., 1996. Adult educators and the challenge of the learning organization. *Adult Learning*, 7(4), pp. 18.

10 Baker, W.E., Sinkula, J. M., 1999. Learning Orientation, Market Orientation, and Innovation: Integrating and Extending Models of Organizational Performance. *Journal of Market-Focused Management*, 4(4), pp. 295-308.

11 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228

12 Burton Swanson, E., 1997. Maintaining IS quality. *Information and Software Technology*, 39(12), pp. 845-850.

13 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228

14 DeLone, William H., McLean, Ephraim R., 1992. Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), pp. 60-95.

15 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228.

work in the domain due to the significance of IS quality.

Whilst these studies have been done successfully in developed countries<sup>16</sup>, they have not adequately addressed the issue of the link between a learning organisation culture, and information systems quality for specific industries such as mining operations in rural Africa.

It is against this background that the researcher became interested in to investigating the puzzle of the learning organisation culture that exists to adopt technology among the employees recruited from the local community and how this is linked to information systems quality in such mining operations

The researcher acquired the interest for this study through working at Lumwana Mining Company as a team leader of the Information Technology department. This mine is encircled by Lumwana rural society, from where the mine recruits several employees as part of social sustainability. The researcher discusses the Lumwana rural society and internal organisation environment in more detail in the case study in Chapter 2.

## 1.2. Definitions of Terms

The key words and phrases used in this thesis are learning organisation, dimension of learning organisation, information systems quality, information quality, system quality and service quality. These are defined in the current section to give the reader the appropriate context in which they have been used.

### **Learning organisation**

It is the “...attaining, enhancing and transmitting the knowledge, assisting personal and shared learning, merging and altering conducts and customs of the firm and its members on account of learning”.<sup>17</sup>

### **Dimensions of learning organisation questionnaire (DLOQ)**

This is a technique for measuring a learning organisation culture which was developed by

- 
- 16 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1), pp. 5-22
- 16 Lien, B. Y., Hung, R. Y., Yang, B., and LI, M., 2006. Is the learning organization a valid concept in the Taiwanese context? *International Journal of Manpower*, 27(2), 189-203.
- 16 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.
- 17 Steven H. Appelbaum, W.R., 1998. How to measure an organization's learning ability: the facilitating factors - part II. *Journal of Workplace Learning*, 10(1), pp. 15.

Watkins and Marsik. <sup>18</sup> It has seven dimensions measured by 21 items on a six-point Likert scale (1=almost never; 6=almost always).

### **Information systems quality**

This is described as “Excellence in IS quality comprises of employing modern technology, sticking to the sector’s “best custom” software criteria, and providing performance without any mistakes”. <sup>19</sup>

### **System quality**

This represents the “the subject of quality of information processing, which is typified by application of modern technology, a system providing essential operations and aspects (indicated as IS quality), and software that can be operated easily by people, simple to learn, and does not need too much maintenance (indicated to be the worth of IS)”. <sup>20</sup>

### **Information quality**

This refers to “Results that are beneficial for people in business, pertinent to make decisions, and simple-to-comprehend (indicating both IS quality and worth) in addition to results that fulfil the information requirements of the users (indicating IS quality to be as per plans). Service quality thus, is described to be the degree of service provided by IS service providers to users in the business sector (in contrast to their anticipations) in context of dependability, openness, guarantee and understanding”. <sup>21</sup>

### **IS service quality**

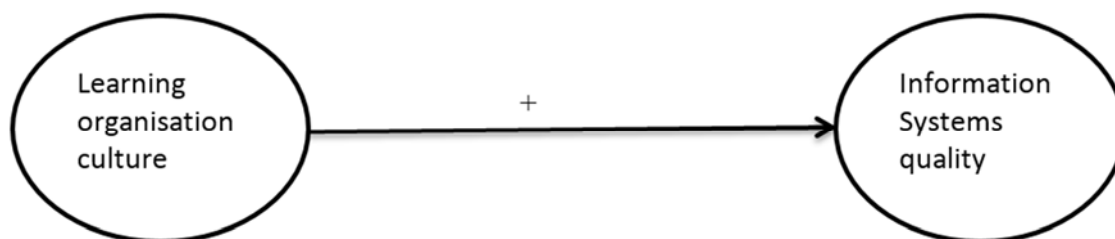
This is reflected “By IS fulfilling the anticipations of the users (by meeting the needs of the IS users by offering services to the users at the time assured, creating assurance in the users of IS, and being considerate to the users when handling service demands) and indicating IS brilliance (by having extremely well-informed IS professionals and by guaranteeing performance without any mistakes)”. <sup>22</sup>

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- 18 Watkins, K.E., Marsick, V.J., Dirani, K.M. and O’neil, J., 2013. The Dimensions of the Learning Organization Questionnaire (the DLOQ). *Advances in Developing Human Resources*, 15(2), pp. 133-147
- 19 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228
- 20 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228
- 21 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228
- 22 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228



### 1.3. Research Framework

The research model that was used to guide this research and the bodies of literature that provided the investigative structure is indicated Figure 1.1 below.



**Figure 1.1: Research framework**

### 1.4. Research Assumptions, Aims and Objectives

The researcher made an assumption that the study would take place in a learning organisation which is a modern mine where information systems are implemented and successfully used by employees from the local community. Further, the local community has historically been a traditional society and is now undergoing modernisation.

The aim of the research was to ascertain whether a functional link exists between the overall learning organisation culture and information systems quality for mining organisations operating in rural Africa.

### 1.5. Research Question

The main question which motivated the study is as follows:-

What is the relationship between the learning organisation culture at Lumwana Mine, and the systems quality, information quality and service quality at the mine, given that the mine operates highly sophisticated processes, including advanced information systems, while the bulk of the operators are drawn from deep rural and traditional cultural and rural backgrounds and were previously not exposed to contemporary computation-driven information systems.

To answer the above question the following hypotheses govern the empirical investigations that are reported on in this thesis:

The null (no association) research hypothesis states that the overall learning organisation culture does not positively impact information systems quality.

The alternative (association) research hypothesis states that the overall learning organisation culture positively impacts information systems quality.

## **1.6. Methodology and Research Design**

The mixed methodology research approach was used for this research study. This methodology uses both quantitative and qualitative approaches. The study was planned so as to employ a mixed investigative technique to ensure collecting comprehensive data about the learning organisation culture and information systems quality measures. The study used triangulation findings of a case study and quantitative research methodology to cross check with results of the qualitative research methodology. The data gathered from preliminary interviews assisted with the development of the questionnaire. Whilst quantitative and qualitative methodologies have advantages and disadvantages, the mixed methodology optimises the advantages and minimises the disadvantages offered by each methodology.

First, the researcher used a case study approach to gather information on the specific case under study. The data collection method for the case study involved review of secondary sources such as social impact assessment, training policy, and information technology strategy plans, etc. The researcher also gathered primary data from preliminary interviews with a sample of five individuals. These were purposively sampled as they had been recruited from the local community. The results of the content review arising from interview data were used to clarify the inferences of the questionnaire.

The population for the research study comprised the 1131 employees all recruited from the local community. All these employees had access to an information system. From the sample selected for the research, the researcher chose a purposive sample of 100.

Secondly, the quantitative aspects of the study involved the use of a questionnaire which was administered to the employees in the sample, to gain a comprehensive view of learning organisation culture and information system quality measures. The researcher decided on a survey to ensure easy usage and to facilitate a quick response. The other advantages related to this data gathering technique included the adaptability of planning the research structure, the capability to permit a reasonable sample and lowered outlays.<sup>23</sup> According to many surveys, there are yet several problems that are related to gathering data employing this technique.<sup>24</sup>

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23 Weible, Rick, Wallace, John, 1998. Cyber Research- The impact of the internet on data collection. Marketing research : a quarterly business management publication of the American Marketing Association., 10(3), pp. 19.

24 Dillman, Don A., Smyth, Jolene D., Christian, Leah Melani., 2009. Internet, mail, and mixed-mode

Descriptive statistics and structural equation modelling using partial least squares was employed to analyse the data and investigate the associations amongst the variables under examination. SmartPLS software was employed by to undertake this process. <sup>25</sup>

### **1.7. Limitations and Delimitations**

One of the drawbacks of the study was the selection of a particular sector, namely mining and also one specific organisation, Lumwana mining. This would potentially influence the dependent variables. Secondly, if this research is repeated in different contexts where information systems are used, such as the agriculture and tourism industries in rural Africa, it may yield different results. Thirdly, the researcher was among the staff that offers support for the system and this could have caused bias in respondents, specifically during semi-structured interviews. The discussion on how the limitations were dealt with are provided in Chapter 4 of this thesis.

Delimitation is an act of the investigator to impose boundaries on the research project in order to ensure focus. The researcher conducted this study in one mining company, which is part of a global mining giant. The operation under study was in the Lumwana rural area located in North Western Zambia in Africa. The population for data collection consisted of all employees recruited from the local community.

### **1.8. Significance of the Research**

The research is very significant as the learning organisation culture and information systems quality measures are tied to corporate performance and eventual survival. <sup>26</sup> With a lot of research done in more developed countries such as the USA, this research investigated and has provided empirical evidence from an organisation operating in deep rural Africa and in the mining industry specifically. This has created new insight and interpretations. The results of this research are crucial for practice and theory.

### **1.9. Thesis Outline**

The remainder of the thesis is as follows:

Chapter 2 gives a detailed account of Lumwana rural society where the majority of employees are recruited via the Local Employment Register (LER). It also discusses learning

surveys: the tailored design method. Hoboken, N.J.: Wiley & Sons.

25 Ringle, C. M., Wende, S., Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, <http://www.smartpls.com>.

26 Egan, T.M., Yang, B. and Bartlett, K.R., 2004. The effects of organizational learning culture and job satisfaction on motivation to transfer learning and turnover intention. *Human Resource Development Quarterly*, 15(3), pp. 279-301.

organisation practices around information systems at Lumwana.

Chapter 3 outlines the theoretical background of the study which includes modernisation theory, the technology acceptance model, the analysis of the learning organisation culture employing the DLOQ developed by Watkins and Marsik.<sup>27</sup> It further reviews the literature on information systems quality derived from the Delone and Mclean's (D &M's) information systems success model.<sup>28</sup>

Chapter 4 discusses the unit of analysis, the mixed methodology, explaining the research philosophy and paradigm approaches, qualitative and quantitative data collection designs and procedure.

Chapter 5 deals with the analysis of the results using descriptive statistics and partial least squares using structured equation modelling. The model reliability and validity are discussed here.

Chapter 6 outlines the results of the research, discussing the findings in light of the models used and explaining the implications for practice and theory. It further presents the research conclusions and makes suggestions for further research.

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27 Marsick, V.J. and Watkins, K.E., 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire

28 DeLone, W.H. and McLean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update

# *Chapter 2*

## A Case Study of Lumwana Mine

### **2.1 Introduction**

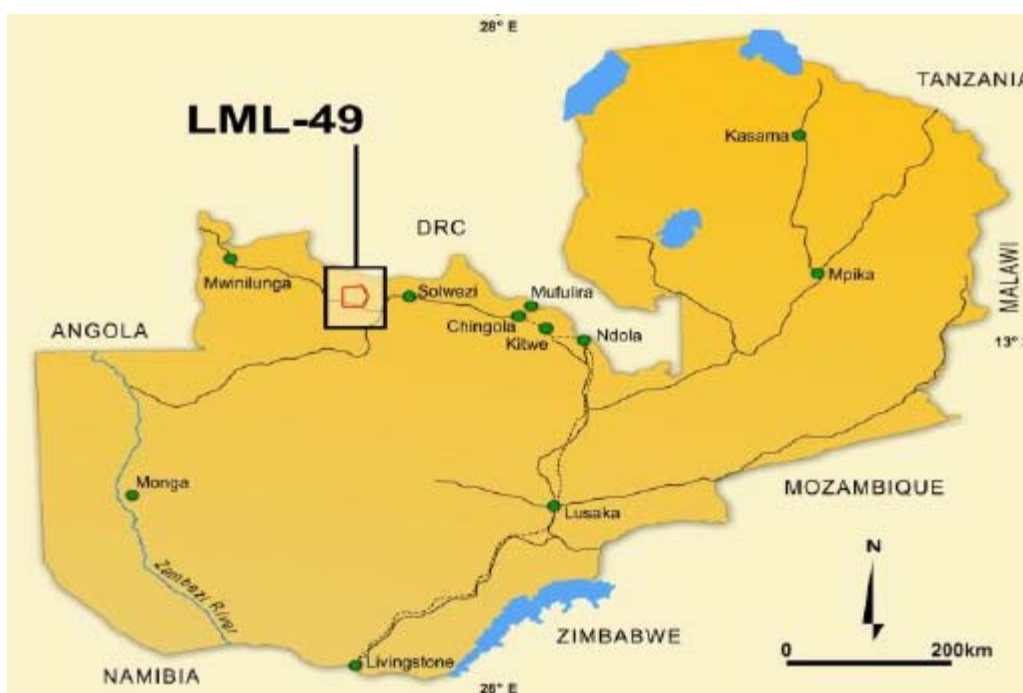
This chapter presents a case study of Lumwana Mining Company. This mining company operates in the rural part of Zambia and it is assumed that it is a learning organisation with various information systems. The next section is a high level description of the mine's external and internal business environment. The context is about the investigation of the Lumwana Mining Company's external political, economic and the social environment from where the majority of the workforce is employed from. This was of interest to this research because, firstly, most of the employees recruited from the local community via the LER are the majority in the organisation and use information systems as part of their day to day work. Secondly, the area is an example of deep rural Africa which has been a traditional society and is undergoing modernisation. The author further explains in brief terms the Lumwana Mining operations, information systems and the learning process for the workforce. In order to obtain information for this chapter, a case study protocol was drawn up and this is discussed in Chapter 4 of this thesis.

### **2.2 About Lumwana Mining Company**

Lumwana Copper Mining Company is located in rural Zambia, Southern Africa. The Lumwana mine is situated in Kalumbila district in the North Western Province of Zambia which is roughly a distance of 300 km by road from the Copperbelt city of Kitwe and 95 km west by road on the North West Highway (the T-5) of the provincial centre of Solwezi, at latitude 12°26' South and longitude 25°85' East. The mine is on a Large Scale Mining

Licence (LML-49) for a time frame of 25 years. This area is shown on Figure 2.1 and covers an area of 1,355 km<sup>2</sup>. This company which mainly mines copper was built and operated by Equinox Minerals Limited, an Australian explorer and a resource development firm which was bought off by Barrick Gold Cooperation in 2011. Barrick runs mines and conducts advanced investigation and development ventures in five continents, and owns huge tracts of land on a few of the main productive and potential mineral trends. Although Barrick predominately mines gold, it diversified into Copper.

Lumwana is bordered by natural vegetation representative of Miombo woodland. The location comprises of a comparatively large number of plant types, the majority of which also exist across other locations in Zambia. Solwezi is not one of Zambia's well-known wildlife districts, despite some animals which can be spotted in the location. The east Lumwana area is an attractively forested area with negligible habitat conflicts in the forest reserve area.<sup>29</sup> These are very abundant and obvious from the several and incessant bird sounds, generally heard in the area. A number of fauna have moved away due to mining activities.



**Figure 2.1: Location of Lumwana Mine<sup>30</sup>**

### **2.3 Lumwana Mine External Surrounding Environment**

The external surrounding environment of Lumwana is discussed from different dimensions.

29 Mwansa K, Walker G. & Sibilski U. 2005. Lumwana Copper Project-Environmental Impact Assessment

30 Mwansa K, Walker G. & Sibilski U. 2005. Lumwana Copper Project-Environmental Impact Assessment

These are political, social, economic and technological facets.

### 2.3.1 Political

The population around the Lumwana community comes from four chiefdoms. These are Chief Mukumbi, Chief Mumena, Chief Matebo and Chief Musele. The chiefs and their subordinates provide leadership for their people and are an entry point for community programmes. The chiefs are also the custodians of land in their chiefdoms on behalf of their people. In addition, settling of disputes, promoting community developments, providing account at different fora include some of the other roles of the chiefs. Each of the four chiefdoms operates under the headship of a chief, who is backed by Indunas who are indigenously known to be the *Kitumbafumo*. The Kitumbafumo supervise villages whose leader is the village headman or *Benamuzhi*. In some cases, group leaders have been fused into the traditional governance of the communities at the levels of either kitumbafumos or Benamuzhi. This measure is intended to utilise available skills, talents and opportunities of some influential personalities among the community members in the traditional governance system

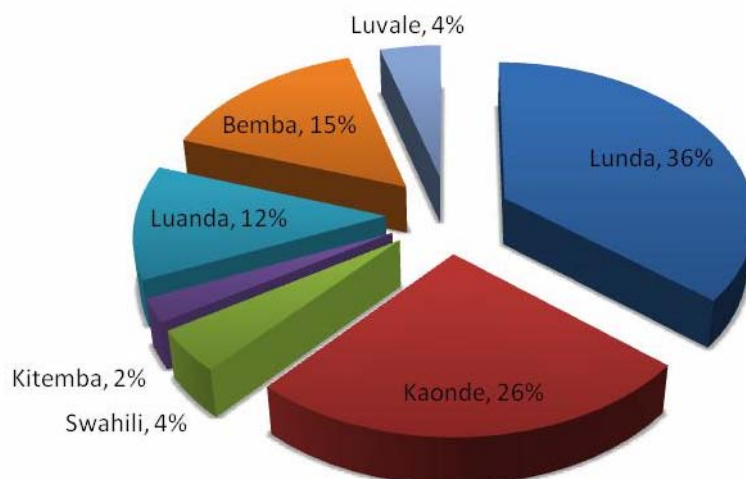
The people of the Lumwana area have rich traditional customs and cultural practices most of which are historical. The traditional ceremonies such as *Kufukwila*, *Mukanda* and *Lubinda* are key for the preservation of the culture and local languages. Initiation ceremonies for the young girls who have come of age and circumcision camps for young boys are common while other cultural practices practised are *Buswan yi* (naming a child after a dead relative's name), the blessing of crop yields by the chief before the commencement of harvest, wearing animal skins and drinking of water from *Lupanda*. The indigenous people of Lumwana further have a unique way of greeting each other by shaking hands and clapping in a particular style and they recognise the traditional leadership of chiefs and their roles.

The study by Kapwepwe<sup>31</sup> identified seven different ethnic groups with the Lundas being the majority at 36 percent followed by the Kaondes at 26 percent, then the Bembas at while 15 percent closely followed by the Luandas from Angola at 12 percent. Figure 2.2 indicates the distribution of ethnic groups as reported by Kapwepwe's study.<sup>32</sup>

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31 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

32 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study



**Figure 2.2: Ethnic groups of Lumwana area.** <sup>33</sup>

The most spoken understood languages in the villages include Nyanja, English, Tonga, Chokwe, Mbunda, Kabanga, Tumbuka and Swahili.

### 2.3.2 Social

The social environment around Lumwana community comprises of religious practices and beliefs, and health and social amenities.

Church facilities are recreation facilities for people who consider praying at church as recreation. Christianity was found to be the main religion in the Lumwana area with prominent churches being Catholic, Jehovah's Witnesses, Seventh Day Adventists, Evangelical and Pentecostals. Some local people practice Muhwelo or animism.

Mosquito bites are the main cause of sicknesses in the Lumwana communities, prolonged on account of the restricted availability of mosquito nets and the long grass vegetation encircling the villages. Kapwepwe et al <sup>34</sup> reported that there is also lack of access to clean, safe water, and that many suffer from poor diet, increased dust in the area and poor sanitation facilities in the area.

The various gender dimensions of the community have changed with the establishment of Lumwana Mine in the area. The changes in gender dimensions include gender-based

33 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

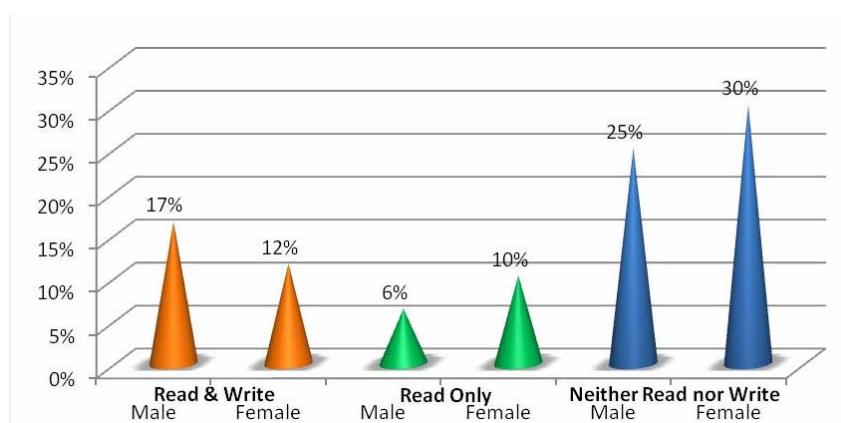
34 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study



violence, equal access to services, participation in community activities and sharing of responsibilities among others. Gender facets are accorded consideration by endorsing engagement and involvement of both the males and females in all society advancement happenings. Most of the jobs at Lumwana mine are done by males as they require physical strength and therefore most females are unable to cope.

Lumwana area, for historical reasons, is a region awakening from low literacy levels due to poor educational facilities and minimal opportunities for higher education. The study by Kapwepwe et al <sup>35</sup> found that the number of community participants in the study who could both read and write was 1,122, or 28 percent of the total number of 3,984 respondents in their study. Those who could only read accounted for 17 percent of people in the study while those who could neither read nor write were the majority accounting for 55 percent of the respondents.

A further assessment by Kapwepwe et al <sup>36</sup> of the literacy levels by gender among Lumwana communities, revealed that of the 3,984 participants in the study of 656(17%) males could read and write as compared to 464(12%) females. Their research further revealed that more females (408 or 10% could) than males (253 or 30%) could read only. As for those who could neither read nor write, the females accounted for the majority (1,202 or 30%) while their male counterparts made up 998 (25%) of the 3,984 participants. Figure 2.3 below further illustrates the gender distribution of the literacy levels.



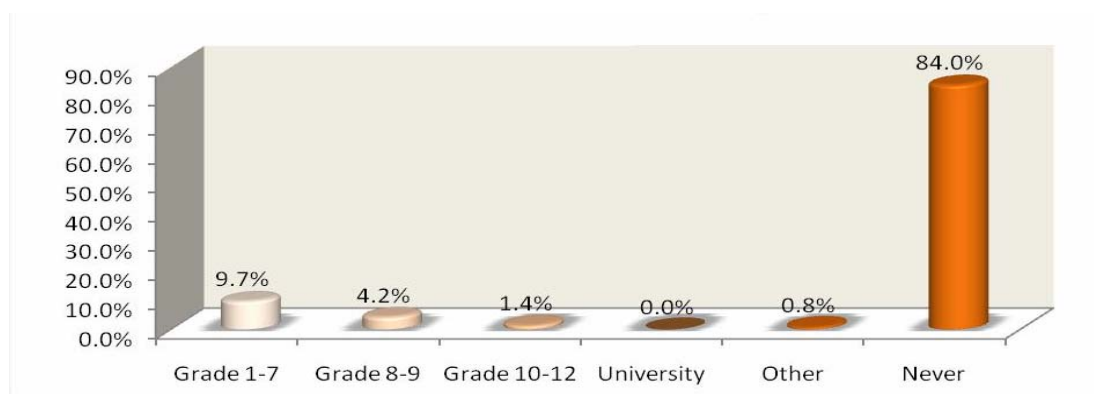
**Figure 2.3: Literacy levels by gender in Lumwana area**<sup>37</sup>

35 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

36 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

37 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability

Baseline indicators in terms of educational levels of the community participants in the research by Kapwepwe et al<sup>38</sup> revealed that an overwhelming majority of 3,345(84%) of the total 3,984 respondents in the research by Kapwepwe et al<sup>39</sup> had never been through formal education. Of the 3,983 respondents, 385(9.7%) indicated that they had reached between grades 1 to7 while only 4.2 percent had reached grades 8 or 9. Only 54(1.4%) respondents had reached between grades 10 to12. None of them indicated that they had been to university. Figure 2.4 below shows the education levels reached by the people of the Lumwana area as per the study by Kapwepwe et al<sup>40</sup>



**Figure 2.4: Educational levels attained by participants in study<sup>41</sup>**

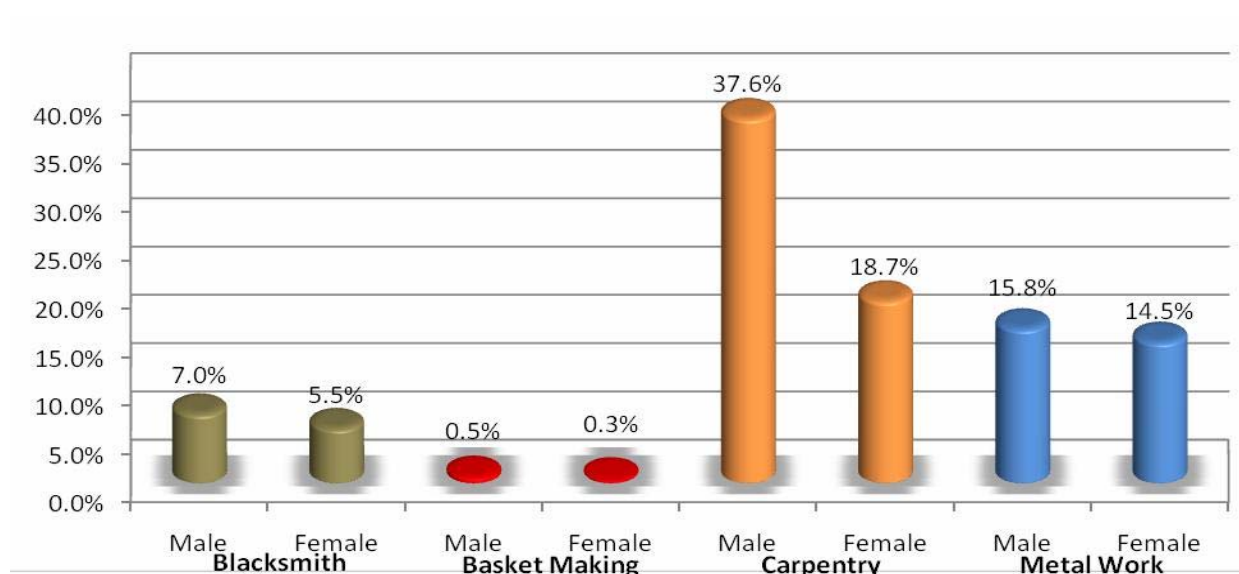
Only 795(20%) of the 3,984 community members who participated in the research by Kapwepwe et al<sup>42</sup> indicated that they had no vocational skills. Despite this research indicating that the Lumwana community members possessed carpentry skills, merely 448(11.2%) of the 3,984 respondents were found to possess these skills, with 241(6%) persons stating metalwork. Merely 100(2%) of the community participants had blacksmithing abilities, while a mere 6 persons (0.2%) stated their skill to be basket making.

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#### Impact Assessment and Baseline Study

- 38 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study
- 39 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study
- 40 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study
- 41 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study
- 42 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

Kapwepwe et al<sup>43</sup> found that of 795 participants who possessed some vocational skills in the study, only 299(37.6%) males indicated that they had carpentry skills compared to 149(18.7%) females. The gender difference among respondents with metalwork skills was very marginal and revealed that the males accounted for 15.8 percent and the females for 14.5 percent of the 795 possessing metalworking skills. Similar baselines were found in blacksmithing with males accounting for 7 percent and females for 5.5 percent and basket making skills among the community respondents for males and females were 0.5 and 0.3 percent respectively. Figure 2.5 below shows a graphical presentation of the vocational skills among Lumwana community members in the study by gender based on the 795 who indicated that they possessed vocational skills.



**Figure 2.5: Vocational skills among community participants in study by gender<sup>44</sup>**

Kapwepwe et al<sup>45</sup> studied another indicator based on level of business skills among the local community members. The majority (244 or 5.6%) of the respondents indicated that they possessed bookkeeping skills followed by marketing skills (119 or 3%). Although some respondents indicated that they had business management and trading skills they only accounted for 1.5 and 1.6 percent of the total number of respondents respectively.

Sports facilities (used for football and athletics) are available and fishing takes place in

43 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

44 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

45 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

rivers and beer drinking at bars.

### 2.3.3 Economic Activities

The main source of livelihood for the people of the Lumwana area is farming which as reported in all the research by Kapwepwe et al. <sup>46</sup> The people of Lumwana area practise shifting cultivation which means they move from their homes during cultivation time and temporarily settle in their fields. The major crops cultivated in Lumwana are maize, cassava and sweet potatoes. The other indigenous crops include millet while the staple food is nshima made from either maize or cassava or a combination of the two.

Some of the other economic activities found among the local according to Kapwepwe et al<sup>47</sup>, are beer brewing at 45.5 percent of the 147 villages visited, while collecting honey and trading were reported as sources of livelihood in 23 percent and 20 percent respectively. Kapwepwe et al<sup>48</sup> stated that the community respondents further revealed that only farming and beer brewing were conducted on a commercial basis with 75 percent of the villages indicating that farming was the major commercial activity, while beer brewing was reported by 14 percent of the villages.

All respondents from the research by Kapwepwe et al<sup>49</sup> indicated that their sources of livelihood were not sufficient to meet their basic needs. Further, findings indicated that 57 percent of the agricultural produce by the Lumwana communities was taken to Solwezi market, while local buyers and traders who visit the area were mentioned as customers by 43percent of respondents in the research by Kapwepwe et al. <sup>50</sup>

The other economic activity which drives the economy around Lumwana is employment by the Lumwana mine. The bulk of workers at Lumwana Mining Company (LMC) are from within the three chiefdoms bordering the mine area but some also come from the other nearby chiefdoms such as Chief Musele's area. The people from the local community are given first priority for domestic employment therefore the advantages of Lumwana mine are

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46 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

47 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

48 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

49 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

50 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

experienced by the local groups. As at the time of the study by Kapwepwe et al<sup>51</sup>, 2,300 local workers had been engaged as casual workers at the lower levels of employment (semi-skilled and unskilled) with the first opportunities given to persons from the Lumwana catchment area.

The employment process was controlled by the chiefs who submitted the names for consideration to the mining company in order to ensure that the local people of Lumwana benefitted, according to the study by Kapwepwe et al.<sup>52</sup>

### **2.3.4 Technological Environment**

The most common modes of transport used around Lumwana includes buses, trucks and bicycles. Kapwepwe et al<sup>53</sup> reported that there was a rise in the vehicular traffic for which money to board was quoted to be a direct result of the Lumwana Mine operations.

Despite having a power inter-connection of a 330kv from Kansanshi Mine to Lumwana, there is no reticulation to the community. The most common sources of energy used are firewood, candles and kerosene or oil lamps with a few making use of solar energy.

Radio and television are the most popular media for information for the people of Lumwana area. Due to the presence of the mine and as part of government policy to ensure network connectivity in rural areas, there are three mobile service providers, namely MTN, Airtel and Cell Z in Lumwana.

## **2.4 Lumwana Mine Internal Organisation Environment**

### **2.4.1 Mining and Process Operations**

Within the midst of the Lumwana rural community is an established world class mining company built in the 21<sup>st</sup> century, which uses state of the art technology. The Lumwana Copper Project is an open-cut mine comprising two pits in two distinct areas. These are Malundwe pits and Chimiwungo pits. The mining operation conducted between 2007 and 2014 took place mainly from Malundwe pit. Thereafter mining was shifted to take place from Chimiwungo. It was estimated that on an annual basis an average of 20 million tons of copper ore would be mined, creating an average of 500,000 tons of copper concentrate on a yearly

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51 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

52 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

53 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

basis. Lumwana mine produces copper concentrate which is sent by road to the Zambian Copperbelt for additional processing to copper cathode. The mine employs the traditional open pit mining and processing methodologies.

The Chimiwungo deposits are mined via the traditional open pit mining techniques that employ both the bulk and selective mining techniques. The mining is executed by employing face shovels in the waste areas and excavators with the help of front end loaders and dozers to mine the ore zones. Each machine is capable enough to mine about 26 Mt on an annual basis and the flexibility to permit it to be transported from face to face if needed. A chimiwungo crusher is then employed to crush the ore and transported through a conveyor belt of approximately 1.2 km. The ore then is moved to the stock piles.

The ore is handled employing a conventional milling and flotation procedure with the intention of generating a copper concentrate product for transport and sale to a smelting and refining service for additional processing to copper cathode. The three stages that are performed for the ore concentration include milling, floatation and concentrate dewatering and storage. Approximately around, 1,200 ton of copper concentrate is stockpiled on a daily basis before being shifted off site to smelting facilities. The walled concentrate storage shed has seven to ten days' ability. Further, storage capacity is also present on the ground made ready adjacently by employing temporary tarpaulin covers for weather protection.

#### **2.4.2 Information Systems delivery**

Business process and control system enablement is the key to the Lumwana Mining Company attainment of the company wide strategic objectives. For this reason, the company has invested in the latest and state of the art information systems and infrastructure. The information systems architecture aligns with the Barrick global information management and technology architecture. Information technology (IT) enables the trend towards globalisation and is often a catalyst for change in supporting new or improved ways of conducting business and facilitating global communications.<sup>54</sup> For this reason, the current system set up ensures the cost effective application of IT while aligned with the business needs and business strategy.

Lumwana Mining Company ensures the new technologies and systems are often selected to improve the company's operational efficiencies. For this reason, essential to the IT strategy is

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54 Zylstra,A, 2009, IT and Communication Systems at Lumwana Mining Company, Lumwana

the enablement of business performance enhancement via successful information and technology provision. This starts with a business requirement which is analysed taking into consideration the people, the process and technology approach to ensure the right people are analysing underlying processes prior to embarking on an enabling technology project. Secondly, once the project has been initiated, a global standard project delivery methodology is employed, to ensure on time, on budget delivery of business benefits. The architecture, selection and implementation of any technologies are done in accordance with global Barrick Information Management and Technology (IMT) standards. The standards are developed to provide robust, secure and reliable technologies for operations, and are the foundation of an efficient operating and reporting controls environment.

As the business processes are dependent on sophisticated software and data processing technologies that are integrated into networked solutions, the system architecture chosen ensures that the design, deployment and support of these systems, networks, and database technologies are in line with the established standards. Essential to this process is the design of a scalable solution in all aspects of Lumwana Information Technology Systems. The functional in-house information technology support structure has four areas of expertise:-

- Communication infrastructure;
- Data centre infrastructure
- Enterprise systems and compliance
- Service delivery

While separate areas, none of these can be effective, implemented and/or function on their own as each one is a stepping block, added and integrated into the other.<sup>55</sup> The effectiveness of IT is directly proportional to the level of integration achieved between the four areas working in conjunction with the offsite-based teams from the Barrick Global IMT Support and the vendors.<sup>56</sup> At the Lumwana Mining Company, there are various integrated information systems that are implemented across the mining value chain and that are capable of producing automated real-time reports. These reports are the key to management decision making throughout the business process. Information is custom displayed to all key players in the process, allowing them to immediately make timely decisions. The key in producing this system is the implementation of a standard fully integrated platform for all site

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55 Zylstra,A, 2009, IT and Communication Systems at Lumwana Mining Company, Lumwana

56 Zylstra,A, 2009, IT and Communication Systems at Lumwana Mining Company, Lumwana



information and data on a stable communications environment and system.<sup>57</sup> The various applications that form part of the enterprise architecture are business enabling applications, core applications, core business (mining information technology) applications and enterprise (business support) applications.

### **2.4.3 Learning Operational Information Systems at Lumwana**

As discussed under the social environment of Lumwana rural society, it is the company's policy to give first priority for employment to individuals from the surrounding community. For this reason, most of the mining and process operators are employed from the surrounding community as part of social sustainable development. In order to develop the required skills in these operators, the organisation has developed a training policy which is aligned at individual, team and organisation level. The courses are delivered through a robust and interactive learning programme which spans across the mining value chain with concentration on operation departments, i.e. Mining operations, Maintenance and Process

The operators learning experience commences with learning about various machines from simulators, and thereafter they are exposed to the computer literacy training. As most of them are new to technologies, individual effort and team learning plays a key role in grasping the basic technology use know how. The organisation level training is provided by the company employing technical advisors who are expatriates and these people provide coaching and mentoring as part of the knowledge transfer process. Refresher training programmes are held to ensure updated knowledge of the technology is shared.

The training programmes offered include computer literacy, shovel, digger, driller, dozer operator, and equipment diagnostic, process operations, copper concentrate logistics system and other specialised information systems training. All these forms of trainings focus on systems use, data entry, core operational procedure, equipment abilities, control room and dashboard interpretations abilities. The dashboards in use include monitoring and using systems such as the Modular Fleet Management System which monitors and tracks ore movement in real time. It uses GPS technology which transmits the data to the specialised screens and dashboard monitoring system where operators view and direct fleet movement.

The other systems that require operators to have dashboard interpretation skills include Mincare and Siemens Process Control Systems. The Mincare System monitors the equipment

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<sup>57</sup> Zylstra,A, 2009, IT and Communication Systems at Lumwana Mining Company, Lumwana



health in real time and sends data to the dashboard enabling maintenance operator personnel to perform planned maintenance and avoid down time. The Siemens process control systems enables operators to monitor various copper processing parameters and report any variances to metallurgists.

The sale of copper is managed through the Copper Concentrate Logistics system which the operators learn to operate through an in house training programme.

## **2.5 Conclusion**

The chapter has presented a case study of Lumwana mine, identifying the external and internal environments, with the focus on advanced information systems used and the learning process for the operators recruited from the surrounding community all of which underpin the research study. Chapter 3 has thus contributed to fulfilling the objectives of the study by establishing the case for research on the link between the learning organisation culture and information systems quality at Lumwana mine. The next chapter discusses the theoretical background.

# Chapter 3

## Theoretical Background

### 3.1 Introduction

The previous chapter outlined the environment in which the research study was conducted. The context involve traditional societies around Lumwana Mining Company which are becoming modernised over time, and the people living there are adopting technology at work through various learning processes and hence having an impact on the use of the organisation information systems. The major theoretical frameworks used as lenses to investigate and understand the situation are: - the modernisation theory<sup>58</sup> using Rostow's stages of development, the technology acceptance model<sup>59</sup> by Davis, Watkins and Marsik's <sup>60</sup> learning organisation model as well as D&M's information systems success model.<sup>61</sup> This chapter presents a review of the literature that underpins this study. In this chapter, the researcher explains the four theoretical frameworks as the foundation that the study is based on and further synthesises the literature and knowledge base related to the research problem.

Chapter 3 is structured as follows, the first section discusses the modernisation theory. The next section is about the technology acceptance model. The third section explores the learning organisation framework. The development of Dimension of Learning Organisation Questionnaire (DLOQ) is discussed in general and with particular attention to the seven dimensions, namely continuous learning, inquiry and dialogue, team learning, embedded

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58 Rostow, W. W. (1960). Stages of economic growth: a non-communist manifesto. Cambridge U.P.

59 Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

60 Marsick, V.J. and Watkins, K.E., 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire

61 Delone, W.H. and Mclean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update

system, empowerment, system connection and strategic leadership. The fourth section discusses in general D&M IS success model and particularly information systems quality measures that are derived from this model. The literature analysis of the theories is presented. A conclusion is made to summarise the discussion in this chapter.

### **3.2 Modernisation Theory**

The context of Lumwana area as discussed in Chapter 2 justifies the need to look at the theory that will be the means to explain the development and social change that has happened in the area in the past eight years. Although there are many theories that explain the development of traditional to modern societies, the modernisation theory by Walter Rostow was chosen for this study.

The phrase modernisation theory indicates a theory according to which the advancement in the developing nations is attained by following the procedures of advancement that the current advanced countries employ.<sup>62</sup> This theory essentially is a socio-economic theory and is also referred to as the development theory by several researchers. This theory typically focuses on the affirmative actions enacted by nations which are advanced and modernised and also assist sustainable advancement in nations that are not equally advanced. It is generally differentiated from the dependency theory according to which advanced nations need to assist developing nations to ensure advancement/growth in these underdeveloped nations and to allow such underdeveloped countries to learn from the experiences of the developed nations and their countries. The theory also considers the government to be essential to modernise the developing societies. According to this theory, underdeveloped nations could advance more quickly compared to the developed nations and similar levels of development are possible in the advanced nations and the underdeveloped ones.<sup>63</sup>

The model of Rostow's theory<sup>64</sup> of modernised development is crucial since it is related to the concept that a nation can advance economically when it emphasises on the resources that have limited supply so as to ensure that the growth empowers domestic industries to conquer international markets thereby providing funds for the nation's development which will

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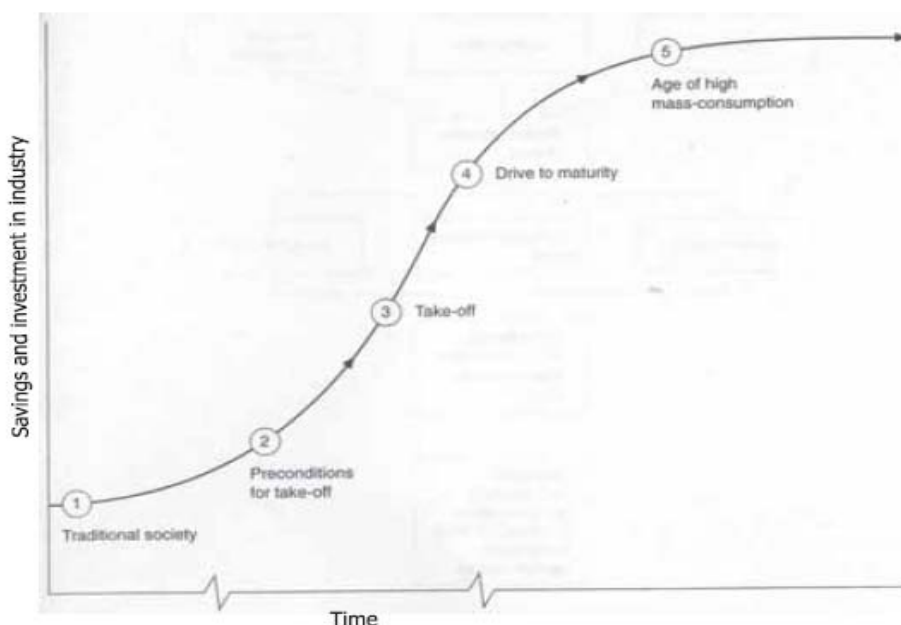
62 Potter, R. B. 1999. Geographies of development. Harlow, Longman.

63 Chenery, H. B., Robinson, S., & Syrquin, M. 1986. Industrialization and growth: a comparative study. New York, Published for the World Bank [by] Oxford University Press

64 Rostow, W. W. 1960. Stages of economic growth: a non-communist manifesto. Cambridge U.P.

consequently result in economic development.<sup>65</sup>

Rostow<sup>66</sup> proposed a five stage model of development. He argued that societies go through linear sequential stages of development which can be identified. Figure 3.1 below illustrates the five stages.



**Figure 3.1: Rostow's five-stage model of development<sup>67</sup>**

The next section provides the details of the five stage model outlined by Rostow.

The first stage is a traditional society. Here agriculture in the traditional way, is what the population does for economic means. The society has a hierarchical structure. Thus, the first stage is linked to any nation or society that has not yet attained development; also, most of the residents in such nations or societies undertake subsistence agriculture and the investments centre around facilities or actions related to the religion and military. In this phase of development the focus is of the societies is the belief that development is possible only with some magic or divine intervention rather than innovation. This also does not indicate that the level of the production in the economy is steady; however, it rises due to extra land cultivation so as to enhance the agriculture production.<sup>68</sup> In this stage, the state and the farmers in this conventional society have knowledge pertaining to different irrigation

65 Todaro, M. P., & Smith, S. C. 2003. Economic development. Boston, Addison Wesley.

66 Rostow, W. W. 1960. Stages of economic growth: a non-communist manifesto. Cambridge U.P.

67 Rostow, W. W. 1960. Stages of economic growth: a non-communist manifesto. Cambridge U.P.

68 Rostow, W. W. 1960. Stages of economic growth: a non-communist manifesto. Cambridge U.P.

techniques and expansion to enhance the output levels of agriculture. At this stage they will require technological ingenuity to address aims.<sup>69</sup> However, the conventional society has some impediments to overcome and this is difficult either due to absence of information or usage and the continuous advancement of science and technology.

Secondly, there are preconditions for the take-off stage. The investment becomes high and the society initiates a changing development. These results from some industrialisation and leads to transformation of agriculture. In this stage, Rostow<sup>70</sup> mentioned that the society experiences several modifications. This stage is typified by huge growth and development of the economy of the mining sector, a rise in the employment of capital in agriculture, the need for extrinsic finances and a limited amount of development in savings and investments. It also comprises of specific aspects that are linked to this change of conventional society via the criteria to the take-off stage. For instance, there is a transition to the industrial or manufacturing society from the agrarian society. Also the trade and commercial activities are expanded from domestic to international markets to ensure that resources are not wasted and that the landowners use the surplus funds to create industries, infrastructure and prepare for self-sustained development.<sup>71</sup> In this stage, there is commercialisation of agriculture and also a development in the actions of the entrepreneurs. However, the agricultural actions still have crucial function in the procedure related to the advancement.

Thirdly, there is a take-off stage which is characterised by dynamic economic development. Self-sustenance growth with no inputs taking place. The third phase is typified by rapid economic development due to the economic, political or technological motivation. The main emphasis of this phase is self-sustained development. This is the stage in which the old blocks and opposition to development are eradicated.<sup>72</sup> It is crucial to comprehend that in this stage there is a rise in both industrialisation and entrepreneurship.<sup>73</sup>

Fourthly, the drive to maturity is characterised by continual investments by 40 to 60 percent. The major factors in this stage are economic and technical progress. The new forms of industries like neo-technical industries emerge i.e. electrical industry, chemical industry or

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69 Todaro, M. P., & Smith, S. C. 2003. *Economic development*. Boston, Addison Wesley.

70 Rostow, W. W. 1960. *Stages of economic growth: a non-communist manifesto*. Cambridge U.P.

71 Chenery, H. B., Robinson, S., & Syrquin, M. 1986. *Industrialization and growth: a comparative study*. New York, Published for the World Bank [by] Oxford University Press

72 Rostow, W. W. 1953. *The process of economic growth*. Oxford, Clarendon Press.

73 Chenery, H. B., Robinson, S., & Syrquin, M. 1986. *Industrialization and growth: a comparative study*. New York, Published for the World Bank [by] Oxford University Press

mechanical engineering.

Last but not the least, this stage is characterised the age of high mass consumption where the segments of society lives in prosperity and persons living in this society are offered abundance and a multiplicity of choices.

### 3.3 Technology Acceptance Model

Apart from the modernisation process, the Lumwana traditional community has experienced an inflow of information and communication technology. The technological devices such as computers and mobile phones are now available in the community and are widely used. Given the background of the Lumwana surrounding rural community as highlighted in Chapter 2, it has been a learning process for most of the people to start working with technology. Among the many theories and models available, the Technology Acceptance Model (TAM) developed by Davis was chosen to explain the acceptance of information technology and information systems.

The TAM was investigated by Davis and published in the MIS Quarterly in 1989.<sup>74</sup> It seeks to predict user acceptance of technology. For any business operating in the 21<sup>st</sup> century, user acceptance of information technology and information systems is very important if business performance has to be achieved. The model is mainly based on the Theory of Reasoned Action (TRA). The TRA has been widely investigated to consciously determine behaviour.<sup>75</sup> Davis concentrated his research on the measurement of key constructs.<sup>76</sup> He proposed forecasting *use (intention)* by focusing on two theoretical constructs: *perceived usefulness* and *perceived ease of use*.<sup>77</sup> According to Davis<sup>78</sup>, users are more willing to use a system or program, if they see an occupational advantage. This variable is measured by *perceived usefulness*. Similar to the TRA, the TAM plans to predict behaviour. If the system is perceived as being useful, the danger still exists that the system could be regarded as too difficult or complicated. The use would not outweigh the effort. This consideration is

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74 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

75 Ajzen, I. and Fishbein, M. (1980), Understanding Attitudes and Predicting Social Behavior, Prentice-Hall, Englewood Cliffs, NJ.

76 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

77 Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. 1989. "User acceptance of computer technology: a comparison of two theoretical models", Management Science, Vol. 35 No. 8, pp. 982-1003.

78 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

measured by *perceived ease of use*.<sup>79</sup> Figure 3.2 below is a diagram of the Technology Acceptance Model.

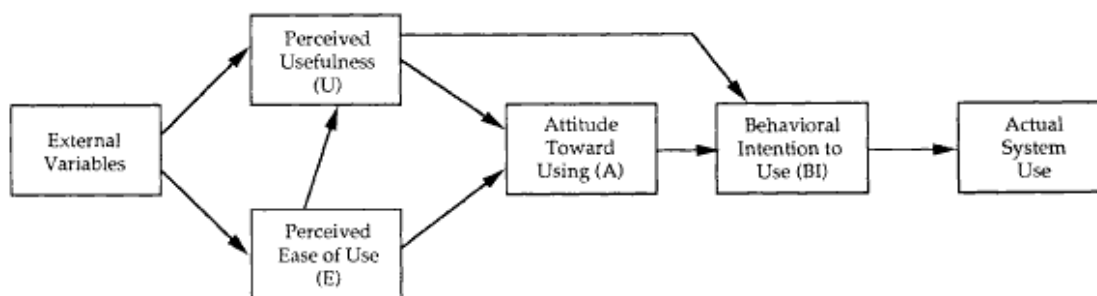


Figure 3.2- Technology Acceptance Model<sup>80</sup>

Figure 3.2 shows that BI (behavioural intention to use) is determined by a person's attitude toward the system (A) and perceived usefulness (U).<sup>81</sup> Thus the equation is  $BI = A + U$ .

Davis<sup>82</sup> Technology Acceptance Model is used by many researchers to determine employment and acceptance of information systems and technology by people on an individual basis. Various researchers have analysed TAM. In the TAM prototype, the two aspects pertinent in computer employment conduct include perceived usefulness and perceived ease of use. Perceived usefulness, according to Davis,<sup>83</sup> is the likely user's individual perception that employing a particular application system will improve their job performance or life. Perceived ease of use (EOU) indicates the extent to which the likely user anticipates the target system to be easy. As stated about TAM, the most crucial factors of real system employment include ease of use and perceived usefulness. These two aspects are in turn impacted by extrinsic variables. The chief extrinsic aspects that impact the same include social aspects, cultural aspects and even political aspects. The language, abilities and assisting criteria are encompassed under social aspects. The political aspects chiefly include the influence of employing technology when there is a political predicament. The attitude to

79 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

80 Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. 1989. "User acceptance of computer technology: a comparison of two theoretical models", Management Science, Vol. 35 No. 8, pp. 982-1003

81 Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. 1989. "User acceptance of computer technology: a comparison of two theoretical models", Management Science, Vol. 35 No. 8, pp. 982-1003

82 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

83 Davis, F.D. 1989. "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, pp. 319-40.

use is related to the user's assessment of the attractiveness of using a specific information system application. Behavioural intent gauges the probability of an individual actually using the application.

TAM has been employed in a variety of ways by analysts across the globe to comprehend the acceptance of varied kinds of information systems.

### **3.4 Watkins and Marsick's Dimensions of the Learning Organization**

#### **3.4.1 Conceptualization and Definition of Learning Organization**

In order for technology adoption to take place especially by individuals with no technology training and experience, an effective learning organisation culture has to exist. The learning organisation culture plays a critical role especially if information systems success is to be realised as this is a key component of the knowledge economy where there is a rapidly changing business environment with the evolution of technology, competition, and innovation.<sup>84</sup> As stated previously, Leitch et al<sup>85</sup> suggested that learning is very important part for organisations to adapt and grow. The survival of many organisations is dependent on how they adapt with technology and embrace learning as part of their day-to-day working culture.

Despite many definitions of a learning organisation which exists in most management literature, as stated previously, the author of this thesis adopted the definition which states that it is the “acquiring, improving and transferring of knowledge, facilitating individual and collective learning, integrating and modifying behaviours and practices of the organisation and its member as a result of learning”<sup>86</sup> According to Watkins and Marsick,<sup>87 88</sup> a learning organisation is defined as “one that learns continuously and transforms itself”. Learning is a continuous, strategically used process integrated with and running parallel to work. Learning also enhances organisational capacity for innovation and growth. The learning organisation has embedded systems to capture and share learning.

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84 Egan, T.M., Yang, B. and Bartlett, K.R., 2004. The effects of organizational learning culture and job satisfaction on motivation to transfer learning and turnover intention

85 Leitch, C., Harrison, R., Burgoyne, J. and Blanter, C., 1996. Learning organizations: the measurement of company performance.

86 Leitch, C., Harrison, R., Burgoyne, J. and Blanter, C., 1996. Learning organizations: the measurement of company performance.

87 Watkins, K. E., and Marsick, V. J., 1993. Sculpting the learning organization: Lessons in the art and science of systemic change: Jossey-Bass.

88 Watkins, K. E., and Marsick, V. J., 1996. In action: Creating the learning organization. Alexandria, VA: American Society for Training and Development.



In a practical perspective, Slater and Narver<sup>89</sup> view a learning organisation as one that continuously acquires, processes, and disseminates knowledge about market, products, technologies, and business processes, and this knowledge is often based on experience, experimentation, and information provided by customers, suppliers, competitors, and other sources.

In the past decade, Jensen<sup>90</sup> defined a learning organisation in the broader perspective as “an organization that is organized to scan for information in its environment, by itself creating information and promoting individuals to transform information into knowledge and coordinate this knowledge between the individuals so that new insight is obtained”.

From a more integrated environmental perspective, Song, Kim and Kim<sup>91</sup> described a learning organisation as “a structure-based learning environment with factors that trigger individuals’ learning and knowledge transformation autogenously for the promotion of continuous and spontaneous organisational learning process within the organisation itself.

Senge’s influential work, as reflected in Watkins and Marsick,<sup>92</sup> offers the merit of being an eye-opener to the theory that describes the learning organisation. The scholar laid the foundation for research interest that followed his publication and continues to grow in the business environment. However, Senge<sup>93</sup> has been criticised by Garvin<sup>94</sup> for leaving too many questions unanswered. Senge has also been criticised for making recommendations that are too abstract since he does not provide guidance or a framework for action.

Pedler et al<sup>95</sup> conceptualisation of the Watkins and Marsick model is comprised of 11 elements. The model has several strengths for such a pioneering effort. The idea of the boundary worker attaches the importance of learning within organisations to front-line

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89 Slater, S. F., and Narver, J. C., 1994. Market orientation, customer value, and superior performance. *Business Horizons*, 37(2), 22-28.

90 Jensen, P. E., 2005. A contextual theory of learning and the learning organization. *Knowledge and Process Management*, 12(1), 53-64.

91 Song, J. H., Kim, J. Y., and Kim, Y. S., 2007. Contextual integration of learning organism theories: There is no configuration, but are they same? Paper presented at the 2007 Conference of Academy of Human Resource Development, Indianapolis, IN

92 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

93 Senge, P.M., 1994; 1990. *The fifth discipline the art and practice of the learning organization*. New York: Currency Doubleday

94 Garvin, D. A., 1993. Building a learning organization. *Harvard Business Review*, 71(4), 78– 91.

95 Pedler, M., Burgoyne, J., and Boydell, T., 1991. *The Learning Company: A Strategy for Sustainable Development*. England: McGraw-Hill Publishing Company.

workers.<sup>96</sup> Furthermore, the book by Pedler et al<sup>97</sup> can be both a theoretical journey for the learning company concept as well as a manual for managers who wish to venture into the learning company field.

In defining the construct of the learning organization, Watkins and Marsick provide an integrative concept of the learning organization based on several approaches comprising: learning perspective-comprehensive aspects of learning<sup>98</sup>, systems thinking-organizational generativity,<sup>99</sup> and strategic perspective-managerial practices.<sup>100 101</sup>

In a broader theoretical viewpoint, Watkins and Marsick<sup>102 103 104</sup> suggested using the DLOQ – a constructive concept of learning organisation measures. The DLOQ have seven dimensions of learning-related factors in both people-oriented and structure-oriented components. The authors consider the model of an effective learning organisation as one that has the capability to integrate people and organisational structures in order to facilitate continuous learning and encourage organisational changes.<sup>105</sup>

There is much debate as to whether the learning organisation is a the best prescription for an organisation in this knowledge economy, with Kuchinke<sup>106</sup> suggesting that it is a management trend promoted for management problems without benefiting research based evaluations. Forrester et al argued that it is a tool for oppression and control by management

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96 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

97 Pedler, M., Burgoyne, J., and Boydell, T., 1991. *The Learning Company: A Strategy for Sustainable Development*. England: McGraw-Hill Publishing Company.

98 Pedler, M., Burgoyne, J., and Boydell, T., 1991. *The Learning Company: A Strategy for Sustainable Development*. England: McGraw-Hill Publishing Company.

99 Senge, P.M., 1994; 1990. *The fifth discipline the art and practice of the learning organization*. New York: Currency Doubleday

100 Garvin, D. A., 1993. Building a learning organization. *Harvard Business Review*, 71(4), 78– 91.

101 Goh, S. C., 1998. Toward a learning organization: The strategic building blocks. *S.A.M. Advanced Management Journal*, 63(2), 15-20.

102 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

103 Watkins, K. E., and Marsick, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development.

104 Watkins, K. E., Yang, B., and Marsick, V. J., 1997. *Measuring dimensions of the learning organizations*. Paper presented at the Academy of Human Resource Development Conference, Atlanta, GA.

105 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55

106 Kuchinke, K.P., 1995. Managing learning for performance. *Human Resource Development Quarterly*, 6(3), pp. 307.

on workers management.<sup>107</sup>

However, Baker et al<sup>108</sup> argued that a learning organisation culture promotes individual, team and organisational learning and these results in improved performance. Marsick and Watkins<sup>109</sup> also argues that all organisations learn but that learning organisations are characterised by proactive interventions to generate, capture, store, share and use learning at the systems level in order to create innovative products and services. Marsick and Watkins support the idea that the concept has multiple possibilities in their contention that “the learning organisation is not a prescription, but rather a template for the examination of current practices”.<sup>110</sup> They believe that “[o]rganizations need to develop the capacity to diagnose their learning orientations, and, when necessary, to add to their repertoire of learning responses or to change them”.<sup>111</sup> In this sense, organisations can apply the concept to think about how to enhance workplace learning in a manner that benefits both the goals of the organisation and the individual workers who make up the organisation. Marsick and Watkins<sup>112</sup> proposed a framework, the DLOQ which has been used widely in determining the effectiveness of the learning organisation culture.

### 3.4.2 Watkins & Marsick’s Model of the Learning Organization

According to the Watkins and Marsick<sup>113</sup> model, the seven dimensions of a learning organization culture include: (i) Continuous learning, which refers to creating and supporting continuous learning opportunities, (ii) Inquiry and dialogue, which promotes interactive inquiry and dialogue, (iii) Team-based learning, which encourages collaborative team-based learning activities, (iv) Empowerment, which refers to empowering people toward a collective vision, (v) Embedded system, which refers to establishing systems to capture and

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107 Forrester, K. Payne, John, w. Kevin, 1995. Workplace learning : perspectives on education, training, and work

108 Baker, W.E., Sinkula, J.M., 1999. Learning Orientation, Market Orientation, and Innovation: Integrating and Extending Models of Organizational Performance. *Journal of Market-Focused Management*, 4(4), pp. 295-308

109 Marsick, V. J., Watkins, K E., 1999. Looking Again at Learning in the Learning Organization: A Tool that Can Turn into a Weapon! *Learning Organization*, 6(5), pp. 206-11

110 Marsick, V. J., Watkins, K. E., 1994. The learning organization: An integrative vision for HRD. *HRDQ Human Resource Development Quarterly*, 5(4), pp. 353-360.

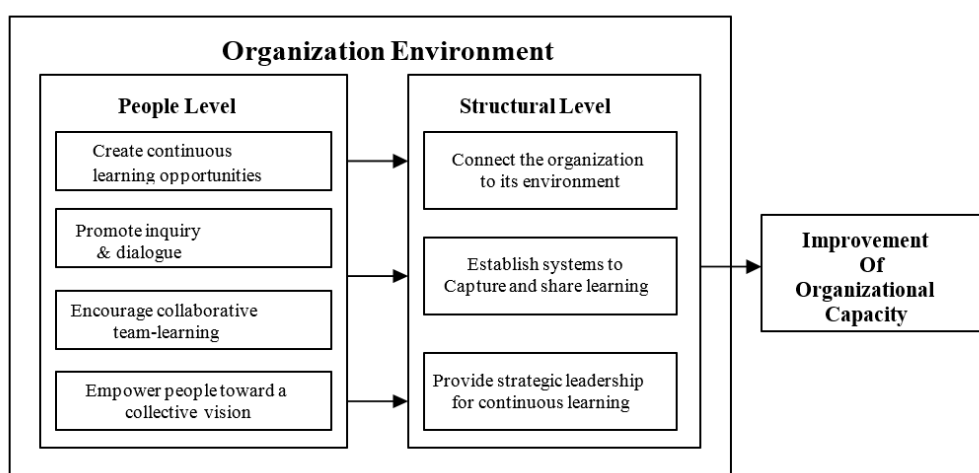
111 Marsick, V. J., Watkins, K E., 1999. Looking Again at Learning in the Learning Organization: A Tool that Can Turn into a Weapon! *Learning Organization*, 6(5), pp. 206-11

112 Marsick, V. J., Watkins, K E., 1994. The learning organization: An integrative vision for HRD. *HRDQ Human Resource Development Quarterly*, 5(4), pp. 353-360.

113 Watkins, K. E., and Marsick, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development.

share learning (vi) System connection, which refers to connecting an organisation to its environment, and (vii) Strategic leadership, which focuses on providing strategic leadership for learning practices.

Watkins and Marsick<sup>114</sup> indicated that the learning organisation design depends on these seven complementary and imperative dimensions based on the interaction between people and the systematic structure in the organisation. The integrated concept of the learning organisation is presented in Figure 3.3 that follows.



**Figure 3.3: Watkins and Marsick model<sup>115</sup>**

#### a) Create Continuous Learning Opportunities

Watkins and Marsick<sup>116</sup> explained that “yesterday’s organizations can be described as machine-like, today’s as systems-like, and the future’s as brain-like”. In today’s workplace, a continuous learning opportunity means that: learning becomes an everyday part of the job. This requires it to be built into routine tasks. Hence, employees are expected to learn not only skills relating to their own jobs but also the skills of others in their work unit as well as how their work unit relates to the operation and goals of the business. The employees are expected

114 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

114 Watkins, K. E., and Marsick, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development.

115 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

115 Watkins, K. E., and MARSICK, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development

116 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

to teach, as well as learn from, their co-workers. In short, the entire work environment is geared towards and supports the learning of new skills. Watkins and Marsick developed a model of continuous learning based on the problem-solving cycle. The model features alternating cycles of judgment or reflection with taking action.<sup>117</sup> This results in the deepening of learning from work experience.<sup>118</sup> Based on the model, Watkins and Marsick argued that there is no specific time for learning since every challenge can be converted into a learning possibility.<sup>119</sup>

#### **b) Promote Inquiry and Dialogue**

In a learning organisation, people gain productive reasoning skills to express their views.<sup>120</sup> People also gain the capacity to listen and inquire into the views of others. The culture of the organisation needs to support questioning, feedback and experimentation.<sup>121</sup> Through inquiry, Watkins and Marsick<sup>122</sup> noted that people need to explore ideas, questions and potential actions; inquiry is based on open-minded curiosity that suspends presuppositions and judgments in the interests of truth for a better solution.<sup>123</sup>

#### **c) Encourage Collaboration and Team Learning**

According to Watkins and Marsick<sup>124</sup>, work is designed to use groups in order to access different modes of thinking. These groups are expected to learn and work together. Thus, collaboration is valued by the organizational culture and rewarded.<sup>125</sup> However, they also note that it may also happen that when individuals learn, they fail to share the results.

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117 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

118 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

119 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

120 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

121 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

122 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

123 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

124 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

125 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

However, teams are “crucibles” in which ideas can be challenged.<sup>126</sup>

#### **d) Establish Systems to Capture and Share Learning**

Watkins and Marsick<sup>127</sup> noted that both high and low technology systems for sharing learning are created and integrated in the workplace. Access to such systems should be provided, and the systems should be maintained. Even if organisational learning is supported by individual learning, it is the way the organisation does business, that determines systems put in place that favour learning.<sup>128</sup>

#### **e) Empower People Toward a Collective Vision**

Watkins and Marsick<sup>129</sup> argued that in a learning organisation people are involved in setting, owning and implementing a joint vision. Responsibility is distributed close to decision making to motivate people to learn what they are accountable for. This is what Watkins and Marsick call “empowerment”. Learning organisations depend on the participation of many individuals in a collective vision and on the release of the potential locked within them. The learning organisation begins with a shared vision and learning is directed toward that vision.

#### **f) Connect the Organisation to its Community and Environment**

According to Watkins and Marsick,<sup>130</sup> learning organisations have a healthy relationship with their physical, social and cultural environments. The learning organisation acknowledges its dependence on its environment. People are helped to see the impact of their work on the entire enterprise. The people need to scan the environment and use the information obtained to adjust work practices. Watkins and Marsick<sup>131</sup> asserted that the organisation is linked to the community through continuous interaction.

#### **g) Providing Strategic Leadership for Learning**

Watkins and Marsick<sup>132</sup> explained that a leadership model helps to champion and support

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126 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

127 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

128 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

129 Watkins, K. E., and MARSICK, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development

130 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

131 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

132 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

learning. This is why leadership uses learning strategically for business results.

### 3.4.3 The Progress of the DLOQ Model

Initially, the DLOQ contained 43 items to measure the latent variables of each of the seven dimensions. However, Watkins and Marsick<sup>133</sup> refined the DLOQ and produced a short version 21-items, which maintain the original theoretical structure. In 2004, Yang, Watkins and Marsick<sup>134</sup> confirmed the valid model structure of the refined academic 21-item version of the DLOQ, providing the reliable results of confirmatory and exploratory factor analyses (GFI was .92 and .87, meaning that about 90 percent of the variances and covariances of the reported learning culture could be explained by the proposed seven dimensions of the learning organisation).

Furthermore, in order to emphasise practical applications in the actual organisation settings, 12 items were added for measuring the levels of performance improvement in both financial and knowledge domains. Consequently, an instrument that consists of seven dimensions of the learning organization and two measures of performance improvement was developed in two forms (43-items and 21-items) and was named DLOQ: Dimensions of the Learning Organisation Questionnaires.<sup>135</sup>

Watkins and Marsick<sup>136</sup> observed that several authors had written about the learning organisation. In their view, the literature on learning organizations shows that there are different ways of conceptualising the construct that has generated different models and various characteristics of learning organisations, as backed by Ali.<sup>137</sup>

To date, several studies have been conducted in various cultures as validation research of the DLOQ in an effort to develop valid measures of the learning organisation. These studies have been in terms of its psychometric properties, and have been conducted in the U.S., Colombia,

132 Watkins, K. E., and Marsick, V. J., 1996. *In action: Creating the learning organization*. Alexandria, VA: American Society for Training and Development

133 Marsick, V. J., and Watkins, K. E., 2003. Demonstrating the value of an organization's learning culture: The Dimensions of Learning Organizations Questionnaire. *Advances in Developing Human Resources*, 5, 132–151.

134 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.

135 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.

136 Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

137 Ali, K. A., 2012. Academic staff's perceptions of characteristics of learning organization in a higher learning institution. *International Journal of Educational Management*, 26(1), 55–82.



China, and Taiwan contexts.<sup>138</sup> The results of these studies have verified the applicability of the DLOQ in different cultures, providing internal consistency of each item-reliability (coefficient alpha range from .71 to .91) and reliable factor structure of the dimensions of the learning organisation.<sup>139</sup> Besides, several types of subjects have been applied with the DLOQ, to address the applicability of the DLOQ to the overall organisational circumstances providing the valid factor construct of measures, which include leadership, organizational commitment, job satisfaction, learning transfer, and so on, in both educational and business settings across the profit and non-profit levels.<sup>140</sup>

#### 3.4.4 The Need for the Validation of DLOQ

In the initial research of Yang, Watkins, and Marsick<sup>141</sup> the authors stated: “Constructing a valid instrument is an ongoing process. Although there has been evidence of convergent validity of the seven dimensions of the DLOQ, the discriminant nature of the seven dimensions needs to be fully explored in the future. Additional studies are also needed to cross-validate the instrument with different organisational cultures and populations in order to firmly establish its utility and validity”.<sup>142</sup> Hence, any study, including this research needs to accomplish two critical tasks highlighted by initial scholars: to add to the stream of

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138 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1), pp. 5-22

138 Lien, B. Y., Hung, R. Y., Yang, B., and LI, M., 2006. Is the learning organization a valid concept in the Taiwanese context? *International Journal of Manpower*, 27(2), 189-203.

138 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.

139 Lien, B. Y., Hung, R. Y., Yang, B., and LI, M., 2006. Is the learning organization a valid concept in the Taiwanese context? *International Journal of Manpower*, 27(2), 189-203.

140 Hernandez, M., 2000. The impact of the dimensions of the learning organization on the transfer of tacit knowledge process and performance improvement within private manufacturing firms in Colombia. Unpublished Ph. D. thesis, University of Georgia, Athens.

140 Kumar, N., and Idris, K., 2006. An examination of educational institutions' knowledge performance: Analysis, implications and outlines for future research. *The Learning Organization*, 13(1), 96-115.

140 Lim, T. J., 2003. Relationships among organizational commitment, learning organization culture, and job satisfaction in one Korean private organization. Unpublished doctoral dissertation, University of Minnesota.

140 Mchargue, S. K., 1999. Dimensions of the learning organization as determinants of organizational performance in 5-1 non-profit organizations. Unpublished Ed.D., University of Georgia, United States -- Georgia.

140 Wang, X., 2005. Relationships among organizational learning culture, job satisfaction, and organizational commitment in Chinese state-owned and privately owned enterprises. Unpublished Ph.D., University of Minnesota, United States -- Minnesota

141 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.

142 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.



research that builds the overall validity and utility of the DLOQ, and to investigate properties of the instrument scores in an additional cultural context.<sup>143</sup>

According to Yoo<sup>144</sup> and Song<sup>145</sup>, business organisations need to consider the more strategic applications of the learning organisation to overcome an aftermath of financial panic such as in the 1990s. Since the economic crisis in the 1990s, more and more efforts have been made to promote creative innovations in almost all organisations in terms of mergers and acquisitions, restructurings, changing business strategies, and cultural renovations. Song<sup>146</sup> further proposed that organisations should have the critical needs that concern the strategic implications of the learning organisation in order for practical continuous learning in organisations to catch up with global and innovative economic trends.

Furthermore, beyond the practices of the continuous learning process in organisations, the organisations now need to learn how to adapt to the socio-economic changes, and how to link learning practices with the continuous performance improvement.<sup>147</sup> Since business organizations have different and unique cultures and hierarchical organisation structures<sup>148</sup>, applications of numerous types of measurement tools in the context without strict processes of validation have the potential of producing negative side effects.<sup>149</sup>

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143 Yang, B., Watkins, K., and Marsick, V., 2004. The construct of the learning organization: Dimensions, measurement, and validation. *Human Resource Development Quarterly*, 15(1), 31-55.

144 Yoo, J., 2005. Knowledge management and learning organization in real-time enterprise. *Korean Knowledge Management Associations*, 14, 355-375.

145 Song, Y. S., 2000. Directions and strategies for the corporate HRD organization to meet the information and knowledge era of the 21st century. *Business Education Research*, 2(1), 53-69.

146 Song, Y. S., 2000. Directions and strategies for the corporate HRD organization to meet the information and knowledge era of the 21st century. *Business Education Research*, 2(1), 53-69.

147 Song, Y. S., 2000. Directions and strategies for the corporate HRD organization to meet the information and knowledge era of the 21st century. *Business Education Research*, 2(1), 53-69.

147 Song, Y. S., 1999. The directions and strategies of HRD in era of knowledge management *Industrial Education*, 28-31

147 Song, J. H., 2005. A preliminary study of the competencies and roles of WLP and HRD professionals in business organizations in the Republic of Korea. Unpublished Master's thesis, The Pennsylvania State University, University Park.

147 Song, J. H., and PARK, Y. H., 2006. The trend shifting of roles and competencies for Korean WLP practitioners. Paper presented at the 2006 ASTD International Conference and Exposition, Dallas, TX.

148 Song, Y. S., 2000. Directions and strategies for the corporate HRD organization to meet the information and knowledge era of the 21st century. *Business Education Research*, 2(1), 53-69.

149 Song, Y. S., 2000. Directions and strategies for the corporate HRD organization to meet the information and knowledge era of the 21st century. *Business Education Research*, 2(1), 53-69.

149 Sin, S. M., O, H. S., and Park, Y. T., 1999. An empirical study on organizational learning style and performance: Case of Korean firms. *Korean Knowledge Management Associations*, 2, 331-364.

Yoo<sup>150</sup> and Jang, Kim and Kim<sup>151</sup> argued that the applications of learning organisation approaches of more than a few of business organisations have ended in failure. These researchers argued that the reasons for failure were the absence of culturally acceptable instruments and were also due to invalid benchmarking of foreign business cases. All of these issues could be critical barriers against the structural and cultural advantages of organisations.<sup>152</sup>

### 3.4.5 Measurement of the Learning Organization

Half of the original items were deleted from the scale and the remaining half constituted the academic version of the DLOQ.<sup>153</sup> The fit indices for the refined measures of both learning organisation and performance outcomes was done on exploratory and confirmatory samples. In this study by Marsick and Watkins<sup>154</sup>, although the fit indices were less strong for the confirmatory sample, all of the ad hoc fit indices were either above or close to .90, indicating adequate model-data fit. About 90 percent of the variances and covariances of the reported learning culture could be explained by the proposed seven dimensions of learning organisation (GFI was .92 and .87 for the two samples, respectively) according to Marsick and Watkins<sup>155</sup>. Furthermore, the confirmatory factor analysis (CFA) results indicated that all of the retained items loaded on their designated dimensions had strong associations. Because the refined measures formed adequate measurement models for both exploratory and confirmatory samples, evidence of construct validity for the refined academic version of the DLOQ was provided.

The validity evidence would be much stronger had some objective measures of organisational performance been used. In fact, one recent study has moved toward such direction by establishing a relationship between learning organisation concept and objectives measures of

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150 Yoo, J., 2005. Knowledge management and learning organization in real-time enterprise. Korean Knowledge Management Associations, 14, 355-375.

151 Jang, J. A., J., Kim. S., and Kim, D. J., 2001. Case study of learning organization in bencher business organizations. Business Education Research, 3(1), 77-98.

152 Jang, J. A., J., Kim. S., and Kim, D. J., 2001. Case study of learning organization in bencher business organizations. Business Education Research, 3(1), 77-98.

153 Marsick, V. J., and Watkins, K. E., 2003. Demonstrating the value of an organization's learning culture: The Dimensions of Learning Organizations Questionnaire. Advances in Developing Human Resources, 5, 132-151.

154 Marsick, V. J., and Watkins, K. E., 2003. Demonstrating the value of an organization's learning culture: The Dimensions of Learning Organizations Questionnaire. Advances in Developing Human Resources, 5, 132-151.

155 Marsick, V. J., and Watkins, K. E., 2003. Demonstrating the value of an organization's learning culture: The Dimensions of Learning Organizations Questionnaire. Advances in Developing Human Resources, 5, 132-151.

organisational performance.<sup>156</sup> Studies using this approach are extremely necessary in establishing evidence of validity and credibility for fields such as human resource development (HRD) constructs and implied interventions. Other studies include, the study by Ellinger et al<sup>157</sup> which validated the organisational performance measures against objective financial measures.

### **3.4.6 Instrument Refinement**

The seven-factor model with 42 was lengthy and did not fit the data very well. There was a considerable portion of item variation (one-quarter) that could not be explained by the proposed dimensions of the learning organisation. This implies that the proposed factor structure might have been incorrect, or that the factor structure was adequate but the number and nature of items were not adequate indicators of the proposed dimensions. Therefore, it was necessary to examine how the measurement items were represented by the proposed dimensions. It was also of interest to identify a shorter version of the instrument while maintaining the same (or even better) psychometric properties. Such a shorter version of the instrument is of particular interest for research purposes when it can be incorporated. Half of the original items were deleted from the scale and the remaining half constituted the academic version of the DLOQ.<sup>158</sup>

## **3.5 DeLone and McLean Information Systems Success model**

### **3.5.1 DeLone and Mclean Model**

Apart from a learning organisation culture, information systems are implemented as part of gaining competitive advantage and preservation of organisation knowledge. Examples of information systems include enterprise resource planning systems, human resource information systems etc. Most of these information systems have a high cost of licensing, implementation and maintenance. It is for this reason that their success and quality are key to organisation's strategic advantage.

One of the well-known models for measuring information systems success and consequently

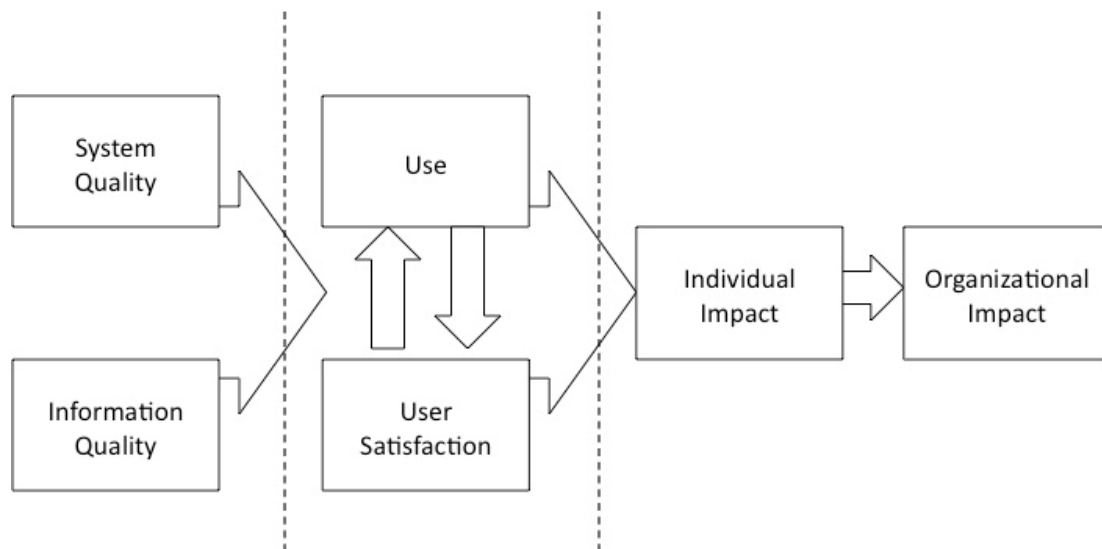
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156 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1), pp. 5-22.

157 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1), pp. 5-22.

158 Marsick, V. J., and Watkins, K. E., 2003. Demonstrating the value of an organization's learning culture: The Dimensions of Learning Organizations Questionnaire. *Advances in Developing Human Resources*, 5, 132-151.

leads to information systems quality discussions is the DeLone and Mclean (D &M) model. In developing this model, DeLone and McLean reviewed IS success factors between 1981 and 1988, and then came up with the D & M success model.<sup>159</sup> Figure below shows is the information systems success model developed by Delone and Mclean in 1992.



**Figure 3.4: Information systems success model<sup>160</sup>**

This model consists of six interdependent variables which are theoretically connected. The following are the definitions of these variables. System quality measures the quality of the information processing within the system.<sup>161</sup> The IS output is measured by *Information quality*. *Use* is seen as the demand or consumption of IS output.<sup>162</sup> *User satisfaction* describes the reaction of the recipient to the use of the IS output. The impact of information on user/receiver behavior is measured by *individual impact*.<sup>163</sup>

DeLone and McLean<sup>164</sup> commented that the model needs further development and validation

159 Delone, William H., Mclean, Ephraim R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95.

160 Delone, William H., Mclean, Ephraim R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95..

160 Delone, W. H., Mclean, E.R., 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), pp. 9-30

161 Delone, W H., Mclean, E. R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95.

162 Delone, W. H., Mclean, Ephraim R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95.

163 Delone, W. H., Mclean, E.R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95.

164 Delone, W.H., Mclean, E. R., 1992. Information Systems Success: The Quest for the Dependent Variable. *isre Information Systems Research*, 3(1), pp. 60-95.

before it could serve as a basis for the selection of appropriate I/S measures. While reflecting on this limitation, IS success needs the use of meta-analyses and standardised measurement methods so as to validate the model. Seddon and Kiew<sup>165</sup> criticises DeLone and McLean's attempt to compress too much in one model. That is why Seddon described it as confusing and erroneously specified. The IS success model gathers success using a depiction of process but also causal factors. Furthermore, Seddon and Kiew<sup>166</sup> problematised the ambiguity of *use*, "Meaning 1: Use" as a variable in a variance model of future.

### 3.5.2 The Three Meanings of IS-Use in the DeLone and McLean's Model

The literature by Delone and Mclean<sup>167</sup> presents three various meanings of IS use:

- Meaning 1: IS use as a variable that proxies from the benefits from use.
- Meaning 2: IS use as the dependent variable in a variance model of future IS use.
- Meaning 3: IS use as an event in a process leading to individual or organisational impact.

Seddon and Kiew<sup>168</sup> clarified the meaning of *IS use* and introduced four new variables: *expectations*, *consequences*, *perceived usefulness* and *net benefits to society*. Additionally, there is a classification of the variables in "Measures of Information and System Quality". The *general perceptual measures of net Benefits of IS use and behaviour with respect to IS use* are considered.

DeLone and McLean<sup>169</sup> discussed which hypotheses had been found to be significant. In descending order, these are: *system use – individual impacts*; *system quality – individual impacts*; *information quality – individual impacts*. With one exception (*system use – organizational revenues*), the other interdependencies have been confirmed as well.

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165 Seddon, P. B. and M-Y Kiew, 1994. A Partial Test and Development of the DeLone and McLean Model of IS Success. Proceedings of the International Conference on Information Systems, Vancouver, Canada (ICIS 94), pp. 99-110.

166 Seddon, P. B. and M-Y Kiew, 1994. A Partial Test and Development of the DeLone and McLean Model of IS Success. Proceedings of the International Conference on Information Systems, Vancouver, Canada (ICIS 94), pp. 99-110.

167 Delone, W.H., Mclean, E.R., 1992. Information Systems Success: The Quest for the Dependent Variable. *ISRE Information Systems Research*, 3(1), pp. 60-95.

168 Seddon, P. B. and M-Y Kiew, 1994. A Partial Test and Development of the DeLone and McLean Model of IS Success. Proceedings of the International Conference on Information Systems, Vancouver, Canada (ICIS 94), pp. 99-110.

169 Delone, W.H., Mclean, E. R., 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), pp. 9-30.

DeLone and McLean rejected Seddon's criticism about *use* being no success factor. Instead, the difficulty is to be seen in the complexity of the *use* variable, and therefore a missing, simple definition.<sup>170</sup> Especially in e-commerce, where system use by customers is essential, DeLone and McLean clarified the importance of *use*.<sup>171</sup>

Besides *Organisational impact* and *individual impact*, further entities could be affected by IS activities. Therefore, researchers suggested considering *group impacts*, *inter-organisational and industry impacts*, *consumer impacts*, and *society Impacts*. Instead of a model extension, DeLone and McLean<sup>172</sup> decided to consolidate all impacts as *net benefits*.

The measurement of IS success or effectiveness is critical to the understanding of the value and efficacy of IS management actions and IS investments. The D&M IS Success Model, though published in 1992, was based on theoretical and empirical IS research conducted by a number of researchers in the 1970s and 1980s. The role of IS has changed and progressed during the last decade. Similarly, academic inquiry into the measurement of IS effectiveness has progressed over the same period. DeLone and Mclean reviewed more than 100 articles, including all the articles in *Information Systems Research*, *Journal of Management Information Systems*, and *MIS Quarterly* since 1993 in order to inform the review of IS success measurement.<sup>173</sup> It is for this reason they updated the D&M IS Success Model after evaluating its usefulness in light of the dramatic changes in IS practice, especially the advent and explosive growth of e-commerce.<sup>174</sup> Figure 3.5 below is the updated DeLone and Mclean model.

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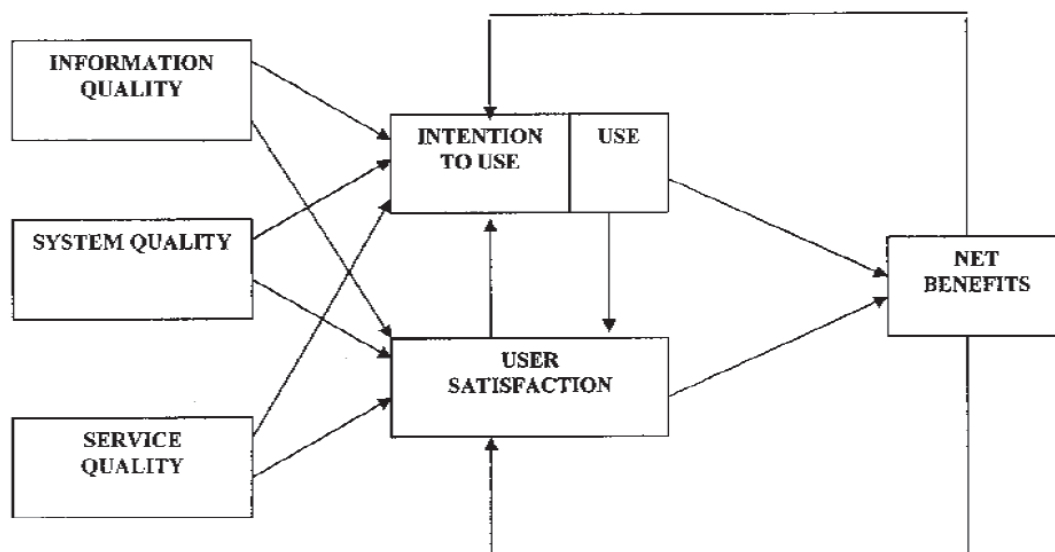
170 Delone, W. H., Mclean, E.R., 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), pp. 9-30.

171 Delone, W.H., Mclean, E.R., 2004. Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *International Journal of Electronic Commerce*, 9(1), pp. 31-47.

172 Delone, W. H., Mclean, E.R., 1992. Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), pp. 60-95.

173 Delone, W.H., Mclean, E. R., 2004. Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *International Journal of Electronic Commerce*, 9(1), pp. 31-47.

174 Delone, William H., Mclean, E. R., 2004. Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model. *International Journal of Electronic Commerce*, 9(1), pp. 31-47.



**Figure 3.5: Updated D&M IS Success Model<sup>175</sup>**

They are two research studies where empirical testing and validation of the D&M IS Success Model was the primary purpose. Seddon and Kiew<sup>176</sup> surveyed 104 users of a recently implemented, university accounting system and found significant relationships between “system quality” with “user satisfaction” and “individual impact,” between “information quality” with “user satisfaction” and “individual impact,” and between “user satisfaction” and “individual impact.” Rai et al<sup>177</sup> performed a goodness-of-fit test on the entire D&M IS Success Model based on survey responses from 274 users of a university student IS. The study found that some goodness-of-fit indicators were significant but others were not. However, *all* of the path coefficients among success dimensions of the D&M IS Success Model were found to be significant.

### 3.5.3 Dependent Variables Versus Independent Variable

Many of the suggested improvements to the D&M IS Success Model are the result of a confusion between what an independent variable is and what part of the dependent variable

<sup>175</sup> Watkins, K. E., and Marsick, V. J., 1993. *Sculpting the learning organization: Lessons in the art and science of systemic change*: Jossey-Bass.

<sup>175</sup> DeLone, W. H., Mclean, E. R., 2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), pp. 9-30

<sup>176</sup> Seddon, P. B. and M-Y Kiew, 1994. A Partial Test and Development of the DeLone and McLean Model of IS Success. *Proceedings of the International Conference on Information Systems, Vancouver, Canada (ICIS 94)*, pp. 99-110.

<sup>177</sup> Rai, A.Lang, S.S. and Welker, R.B., 2002. Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*, 13, 1 (2002), 50–69.



is. “User involvement” and “top management support” are but two examples of suggested additions to the D&M Model; yet these are clearly variables that may *cause* success rather than being a part *of* success. “Investing in ERP” may (or may not) lead to improved “information quality” (an aspect of IS success), but the former is an independent variable whereas the latter is part of the dependent variable. It is essential that IS researchers distinguish between the management control variables and the desired results in terms of quality, use satisfaction, and impacts.

Seddon et al <sup>178</sup> made an important contribution by proposing a two-dimensional matrix for classifying IS effectiveness measures based on the type of system studied and on the stakeholder in whose interest the information system is being evaluated.

### 3.5.4 Information System Quality

One of the most studied dimensions of IS success is information system quality. It refers to measures of the information processing system itself.<sup>179</sup> System quality is the desirable characteristics of an information system. System quality is measured by ease of use, system flexibility, system reliability, and ease of learning, as well as system features of intuitiveness, sophistication, flexibility, and response times.<sup>180</sup> Quality of management information system impacts on the information and on the organisation as a whole. High quality of management information systems means high quality of information, perceived usefulness, decision makers’ satisfaction and an increase in the quality of managerial decision making.

There are a lot of many measures for the system quality and these measures differ from one researcher to another. The common measures for system quality that are used or adopted by many researchers are ease of use, flexibility, response time and reliability. Ease use is the degree to which decision makers believe that using management information system (MIS) for managerial decision making would be free from effort. Low flexibility of the system may cause lower satisfaction of users of the system and have an effect on the quality of the information.

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178 Seddon, P.B., Staples, D.S., Patnayakuni, R. and Bowtell, M.J., 1998. The IS Effectiveness Matrix: The Importance of Stakeholder and System in Measuring IS Success, Proceedings of the International Conference on Information Systems 1998, Association for Information Systems, pp. 165-176.

179 Delone, W. H., Mclean, E.R., 1992. Information Systems Success: The Quest for the Dependent Variable. Information Systems Research, 3(1), pp. 60-95.

180 Petter, S., Delone, W. & Mclean, E., 2008. Measuring information systems success: models, dimensions, measures, and interrelationship. European Journal of Information Systems, 17, 236–263. Operational Research Society Ltd.



Discussing quality in general terms, Gorla et al<sup>181</sup> explained that quality in an organisation is defined by Reeves and Bednar<sup>182</sup> in the following way: quality as excellence, quality as value, quality as conformity to specifications, and quality as meeting customer expectations. Information systems (IS) quality in particular can be understood using Reeves and Bednar's framework of quality. Swanson<sup>183</sup> argued that excellence in IS quality involves using state of the art technology, following industry "best practice" software standards, and delivering "error-free" performance. The value of IS can be realised by improving profit margins for the firm, providing easy-to-use and useful applications, and designing easily maintainable software. Information systems quality as conformance denotes designing systems that conform to the end users' information requirements and adheres to industry standards. Meeting customer expectations of IS quality is accomplished by offering appealing, user-friendly interfaces, entertaining user requests for changes, and satisfying the stakeholders of the IS.

Gorla et al<sup>184</sup> argued that information technology quality is highly important to organisations to derive value in terms of benefits such as improved decision making, providing possible future business avenues, identifying profitable projects and providing accurate and timely information. Increased dependence of organisations on information systems and the organisational losses associated with poor information quality drive management attention towards IS quality improvement.<sup>185</sup>

Gorla et al<sup>186</sup> explained that the above quality definitions broadly characterise IS quality measures namely system quality, information quality, and service quality. These IS quality measures are adapted from the DeLone and McLean IS Success model. As discussed previously in this chapter, DeLone and McLean<sup>187</sup> identified IS success as a multifaceted

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181 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *STRINF Journal of Strategic Information Systems*, 19(3), pp. 207-228

182 Reeves, Carol A., Bednar, David A., 1994. *Defining Quality: Alternatives and Implications*

183 Swanson, E. B., 1997. *Maintaining IS quality*

184 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228

185 Ravichandran, T, Rai, Arun, 2000. *Quality Management in Systems Development: An Organizational System Perspective*

186 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228

187 DeLone, W.H., McLean, E. R., 1992. Information Systems Success: The Quest for the Dependent Variable. *ISRE Information Systems Research*, 3(1), pp. 60-95.

construct consisting of quality measures (system and information quality), attitudinal outcomes (use and satisfaction), and performance-related outcomes (individual and organisational impacts). A stream of research has been conducted to identify IS success measures. DeLone and McLean (D&M) introduced a comprehensive taxonomy to organize this diverse research based on a review of 180 empirical studies, and they developed a model of “temporal and causal” interdependencies between six categories of IS success.<sup>188.</sup>

Seddon<sup>189</sup> presented and justified a re-specified and extended version of the D&M Model of IS Success by splitting the D&M model into two variance sub-models (of use and success) and eliminating the process model interpretation. Although the model has been tested only partially, it has provided a solid theoretical framework toward consolidating previous research on IS success. An “updated” IS success model was proposed in 2003 by DeLone and McLean, which includes IS service quality.<sup>190</sup> As IT impacts not only immediate users, but also work groups, organisations, industries, consumers, and society, DeLone and McLean<sup>191</sup> replaced the individual impact and organisational impact constructs of their original IS success model with “net benefits” constructs in their “updated” model; the authors argued that their revised IS success model can be applied at multiple levels of analysis depending on the task at hand.

Sabherwal et al<sup>192</sup> performed a meta-analysis and their research was based on 121 previous studies published in the period of 1980 to 2004. They determined the relationship between IS success variables (user satisfaction, system use, perceived usefulness, and system quality), user-related constructs, and context-based constructs. The authors found support for the associations between system quality and use, user satisfaction, and net benefits. Furthermore, they found support for the associations of use, net benefits and net benefits, use. The net benefits analysed by the authors are at the individual level.

Prybutok et al<sup>193</sup> analysed the relationship between leadership, IT quality, and net benefits in

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188 Delone, W H., Mclean, E. R., 1992. Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), pp. 60-95.

189 Seddon, P.B., 1997. A Respecification and Extension of the DeLone and McLean Model of IS Success

190 Delone, W.H. and Mclean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems*, 19(4), pp. 9-30.

191 Delone, W.H. and Mclean, E.R., 2003. The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems*, 19(4), pp. 9-30.

192 Sabherwal, Rajiv, Jeyaraj, Anand, Chowa, Charles, 2006. Information system success: individual and organizational determinants.

193 Prybutok, Victor R., Zhang, Xiaoni, Ryan, Sherry D., 2008. Evaluating leadership, IT quality, and net

an e-government environment through a field survey of a municipal city government. They showed support for the relationship between overall IT quality and overall net benefits in this setting. The net benefits construct used by the authors is not solely an organisational impact instrument as it has three questions relating to individual satisfaction, individual performance, and organisational performance. As the IT quality measure they used is a combination of the three quality aspects, the respective impacts of system quality, information quality, and service quality on the dependent variable are not known. Furthermore, they studied e-government in a municipal city government context, which is a special case of a non-profit public organisation. The organisational impacts of interest would be different for this type of organization compared to typical business organizations. Thus, their study results may not be generalisable to industrial organisations.

Gorla et al<sup>194</sup> modelled the relationship between information systems' (IS) quality and organisational impact. Their results show that IS service quality is the most influential variable in this model (followed by information quality and system quality), thus highlighting the importance of IS service quality for organisational performance. This was done in Hong Kong. The results reported may have been biased by perceptions of quality practices and organisational performance reporting practices from respondents in this country.

### **3.5.5 Information Systems Quality Advantages and Impacts**

This section discusses the advantages and impacts of information systems quality to organisations. User satisfaction is recipient response to the use of the output of an information system.<sup>195</sup> User satisfaction is users' level of satisfaction with reports, websites, and support services.<sup>196</sup> User satisfaction refers to the recipient response to the use of the output of IS.<sup>197</sup> Decision makers' satisfaction is defined as the degree to which decision makers believe that the management information system and the information (reports) available to them meets their requirements. There are many measures for the users' satisfaction and these measures differ from one researcher to another. Table 3.1 below,

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benefits in an e-government environment

194 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *STRINF Journal of Strategic Information Systems*, 19(3), pp. 207-228

195 Delone, W H., Mclean, ER., 1992. Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), pp. 60-95.

196 Petter, S., Delone, W. & Mclean, E., 2008. Measuring information systems success: models, dimensions, measures, and interrelationship. *European Journal of Information Systems*, 17, pp.236–263.

197 Halawi, J., Mccarthy, K. L., & Aronson, E. J., 2008. An Empirical Investigation of Knowledge Management System's Success. *Journal of Computer Information Systems*, 48 (2), pp.121-135.

extracted from Hassan et al. <sup>198</sup> shows the users satisfaction measures.

**Table 3.1: User satisfaction measures<sup>199</sup>**

Authors	A.Halawi et al.(2008)	Armstrong et al.(2005)	Wu & Wang(2006)	Chao,Y.(2007)	Sorum et al(2011)	Lai et al.(2009)	Chen, H.(2010)	Hartono et al.(2007)	Percentage
Overall we satisfied with the system	X	X	X		X	X			62.5%
System meets our needs or expectations	X	X	X		X				50.0%
Satisfied with system efficiency	X		X				X		37.5%
Satisfied with system effectiveness	X		X				X		37.5%
Satisfied with system performance				X					12.5%
Short response time for general inquiries					X				12.5%
Short response time to users with specific problems					X				12.5%
As a whole, the system is successful						X			12.5%
I am satisfied with the sufficient information of system that meets my work needs							X		12.5%
The end users have been satisfied with the experience of the meeting supported by the system								X	12.5%
The end users have been satisfied with the output of the meeting supported by the system								X	12.5%
The end users have been satisfied with the experience of the decision making process supported by the system								X	12.5%
The end users have been satisfied with the output of the decision making process supported by the system								X	12.5%
The end users have been satisfied with the overall experience of using the system								X	12.5%

Response time is the length of time taken by a system to respond to an instruction. Decision makers need timely information to make the right decision. Lengthy system response times may cause lower satisfaction of decision makers. Reliability is the degree to which the user and decision makers can trust the MIS. In this regard, the author of this research completely agrees. As stated in the 1992 article by DeLone and McLean, “no single variable is intrinsically better than another, so the choice of success variables is often a function of *the objective of the study, the organizational context*”<sup>200</sup>

Information systems quality presents an opportunity for better decision making. Managerial decision making is selecting alternative from among set of alternatives to solve the particular problem.<sup>201</sup> The quality of a decision making construct is composed of items such as: a

198 Hasan Y, Shamsuddin AA & Aziati N. 2013. The Impact of Management Information Systems Adoption. Managerial Decision Making: A Review. Management Information Systems. 8 (4):010-017

199 Hasan Y, Shamsuddin AA & Aziati N. 2013. The Impact of Management Information Systems Adoption. Managerial Decision Making: A Review. Management Information Systems. 8 (4):010-017

200 Delone, WH., Mclean, E R., 1992. Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research*, 3(1), pp. 60-95.

201 Djasmasbi, S., Strong, D. M., & Dishaw, M., 2010. Affect and acceptance: Examining the effects of positive

perceived increase in the quality of decisions and reduction of the time required for decision making.<sup>202</sup> Quality of decision making includes aspects such as: reduces the time of decision making, helps the organisation to better manage the budget for activities, helps to better allocate resources, helps to better monitor activities, and improves the quality of decisions.<sup>203</sup>

High quality information leads to decision makers' satisfaction. Landrum et al.<sup>204</sup> agreed that information quality is positively correlated with user satisfaction. Perceived information quality predicts user satisfaction. According to Caniëls and Bakens<sup>205</sup> a higher quality of the project management information systems (PMIS) output is satisfaction. Landrum et al.<sup>206</sup> showed that usefulness is positively correlated with user satisfaction. Hwang et al.<sup>207</sup> established that perceived usefulness has a strong direct effect on user satisfaction. Park et al.<sup>208</sup> agreed that perceived usefulness has a positive influence on satisfaction. Ainin, Bahri and Ahmad<sup>209</sup> noted that perceived usefulness will have a significant, positive relationship with user satisfaction level.

Decision makers' satisfaction impacts on quality of managerial decision making. According to Petter et al.,<sup>210</sup> there is a significant, positive relationship between User Satisfaction and Net Benefits. Hwang et al.<sup>211</sup> ascertained that User Satisfaction have strong direct effect on Net Benefits. Park et al.<sup>212</sup> established that User satisfaction has a positive influence on

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mood on the technology acceptance model. *Decision Support Systems*, 48 (2), pp. 383–394.

202 Mcleod, R., 1990. *Management information system*. New York: Macmillan.

203 Caniëls, M. C., & Bakens, R. J., 2012. The effects of Project Management Information Systems on decision making in a multi project environment. *International Journal of Project Management*, 30 (2), pp. 162-175.

204 Landrum, H. T., Prybutok, V. R., Strutton, D., & Zhang, X., 2008. Examining the Merits of usefulness Versus use in an information service Quality and information system success Web-based Model. *Information Resources Management Journal*, 21 (2).

205 Caniëls, M. C., & Bakens, R. J., 2012. The Effects of Project Management Information Systems on Decision Making in a Multi Project Environment. *International Journal of Project Management*, 30 (2), pp. 162-175.

206 Landrum, H. T., Prybutok, V. R., Strutton, D., & Zhang, X., 2008. Examining the Merits of usefulness Versus use in an information service Quality and information system success Web-based Model. *Information Resources Management Journal*, 21 (2).

207 Hwang, H., Chang, I., Chen, F., & Wu, S. (2008). Investigation of the application of KMS for diseases classifications: A study in a Taiwanese hospital. *Expert Systems with Applications*, 34 (1), pp. 725–

208 Park, S., Zo, H., Ciganek, A. P., & Lim, G. G. 2011. Examining success factors in the adoption of digital object identifier systems. *Electronic Commerce Research and Applications*, 10 (6), pp. 626-636.

209 Ainin, S., Bahri, S., & Ahmad, A. 2012. Evaluating portal performance: A study of the National Higher Education Fund Corporation (PTPTN) portal. *Telematics and Informatics*, 29 (1), pp. 314-323.

210 Petter, S., Delone, W. & Mclean, E., 2008. *European Journal of Information Systems*, 17, pp. 236–263.

211 Hwang, H., Chang, I., Chen, F. & Wu, S. 2008. Investigation of the application of KMS for diseases classifications: A study in a Taiwanese hospital. *Expert Systems with Applications*, 34 (1), pp. 725–733

212 Park, S., Zo, H., Ciganek, A. P., & Lim, G. G. 2011. Examining success factors in the adoption of digital

organizational benefit. Balaban, Mu and Divjak<sup>213</sup> reasoned that Electronic Portfolio user satisfaction has a positive effect on net benefits. Urbach et al. in 2010<sup>214</sup> observed that user satisfaction has a positive influence on the individual impact of an employee portal. Petter and Fruhlingb<sup>215</sup> supported that User Satisfaction is positively associated with Individual Impact. Caniëls and Bakens<sup>216</sup> found out that Greater satisfaction of the project manager with PMIS (project management information system) is associated with intensified use of PMIS information in a multi project environment.

Information quality impacts on quality of managerial decision making. Caniëls and Bakens<sup>217</sup> pointed out that a greater quality of the PMIS information output is significantly and positively associated with decision making by project managers. The quality of the information produced by the PMIS is directly related to the quality of decision making. Bharati and Chaudhury<sup>218</sup> established that Information quality is directly and positively correlated to decision making satisfaction so an increase in the quality of the information leads to an increase in decision-making satisfaction.

Information quality is the desirable characteristics of the management information system outputs. Information quality measures the information system output rather than measuring the quality of the system performance.<sup>219</sup> Quality of information affects managerial decision-making. There are many measures for the information quality and these measures differ from one researcher to another. Table 3.2 below, extracted from Hassan et al. <sup>220</sup> shows the information quality measures. In reference to the table, the common measures for information

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object identifier systems. *Electronic Commerce Research and Applications*, 10 (6), pp. 626-636

213 Balaban, I., Mu, E., & Divjak, B. 2013. Development of an electronic Portfolio system success model: An information systems approach. *Computers & Education*, 60 (1), pp. 396-411.

214 Urbach, N., Smolnik, S., & Riempp, G., 2010. An empirical investigation of employee portal success. *The Journal of Strategic Information Systems*, 19 (3), pp. 184-206.

215 Petter, S., & Fruhlingb, A. 2011. Evaluating the success of an emergency response medical information system. *International journal of medical informatics*, 80 (7), pp. 480-489.

216 Caniëls, M. C., & Bakens, R. J., 2012. The Effects of Project Management Information Systems on Decision Making in a Multi Project Environment. *International Journal of Project Management*, 30 (2), pp. 162-175.

217 Caniëls, M. C., & Bakens, R. J., 2012. The Effects of Project Management Information Systems on Decision Making in a Multi Project Environment. *International Journal of Project Management*, 30 (2), pp. 162-175.

218 Bharati, P. & Chaudhury, A. 2004. An empirical investigation of decision making satisfaction in web-based decision support systems. *Decision Support Systems*, 37 (2), 187-197.

219 DeLone, W. H., & McLean, E. R. 1992. *Information Systems Research*, 3 (1), 60-95.

220 Hasan Y, Shamsuddin AA & Aziati N. 2013. The Impact of Management Information Systems Adoption. Managerial Decision Making: A Review. *Management Information Systems*. 8 (4):010-017



quality that have been used by previous researchers are accuracy, completeness, conciseness, relevance, timeliness, amount of information, accessibility and clarity.

**Table 3.1: System quality measures<sup>221</sup>**

Authors	Baraka et al.(2013)	Cheng, Y. et al.(2012)	Sedera & Gable(2004)	A.Halawi et al(2008)	Tsaur(2007)	Chien, & Tsaur(2007)	Finedo & Nahar(2006)	Armstrong et al.(2005)	Livari,J.(2005)	Delone & Mclean(2003)	Chaudhury(2004)	Bharati & Mclean(2009)	Petter & Mclean(2011)	Petter et al.(2008)	Percentage
Ease of use			X	X	X	X	X	X			X	X	X	X	61.5%
Reliability	X			X			X			X	X	X	X	X	61.5%
Response time	X	X		X	X				X	X				X	53.8%
Flexibility	X		X	X			X		X		X			X	53.8%
Integration			X	X			X		X						30.8%
convenience of access				X					X		X	X			30.8%
Ease of learning			X	X			X	X						X	30.7%
User requirements or expectations			X	X			X	X							30.8%
Availability	X									X			X		23.0%
System accuracy			X		X	X									23.0%
Customisation			X			X									15.4%
Sophistication			X											X	15.4%
functionality		X										X			15.4%
efficient						X									7.7%
Adaptability										X					7.7%
Usability										X					7.7%
Has good features						X									7.7%
Recoverability									X						7.7%
usefulness of IS				X											7.7%
User-interface design		X													7.7%
interactivity		X													7.7%
Security													X		7.7%
Intuitiveness													X		7.7%
Intelligent	X														7.7%
Language									X						7.7%
System features			X												7.7%

Decision maker's satisfaction impacts on quality of managerial decision making. According to Petter et al.<sup>222</sup> there is a significant, positive relationship between user satisfaction and net benefits. Hwang et al.<sup>223</sup> ascertained that user satisfaction has a strong direct effect on Net

221 Hasan Y, Shamsuddin AA & Aziati N. 2013. The Impact of Management Information Systems Adoption. Managerial Decision Making: A Review. Management Information Systems. 8 (4):010-017

222 Petter, S., Delone, W. & Mclean, E., 2008. European Journal of Information Systems, 17, 236–263.

223 Hwang, H., Chang, I., Chen, F., & WU, S. 2008. Investigation of the application of KMS for diseases classifications: A study in a Taiwanese hospital. Expert Systems with Applications, 34 (1), pp. 725-733

Benefits. Park et al.<sup>224</sup> supported that User satisfaction has a positive influence on organisational benefit. Balaban, Mu and Divjak<sup>225</sup> found out that that electronic portfolio user satisfaction has a positive effect on net benefits. User satisfaction has a positive influence on the individual impact of an employee portal.<sup>226</sup> Petter and Fruhlingb<sup>227</sup> agreed that user satisfaction is positively associated with Individual Impact.

As reported by De Lone and McLean in 1992, many researchers have used use as an objective measure of system success. The implication is that if a system is used, it must be useful, and therefore successful. However, non-use does not necessarily mean a system is not useful, it may simply mean that the potential user has other more pressing things to be done.<sup>228</sup> The broad concept of use as a measure of information system success only makes sense for voluntary or discretionary users as opposed to captive users, and therefore this construct (use) was omitted from the developed model.<sup>229</sup>

According to Patterson,<sup>230</sup> the critical factor for IS success measurement is not system use but that net benefits should flow from use. Caniëls and Bakens found that greater satisfaction of the project manager with PMIS is associated with intensified use of PMIS information in a multi-project environment.<sup>231</sup> Intensified use of PMIS information has a positive impact on the quality of decision making in a multi project environment.

As the “impacts” of IS have evolved beyond the immediate user, researchers have suggested additional IS impact measures, such as work group impacts, inter-organisational and industry impacts, consumer impacts, and societal impacts. Clearly, there is a continuum of ever-increasing entities, from individuals to national economic accounts, which could be affected by IS activity. The choice of where the impacts should be measured will depend on the

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224 Park, S., Zo, H., Ciganek, A. P., & Lim, G. G. 2011. *Electronic Commerce Research and Applications*, 10 (6), pp. 626-636.

225 Balaban, I., Mu, E., & Divjak, B. 2013. Development of An Electronic Portfolio System Success Model: An information systems approach. *Computers & Education*, 60 (1), pp. 396-411.

226 Urbach, N., Smolnik, S., & Riempp, G., 2010. An empirical investigation of employee portal success. *The Journal of Strategic Information Systems*, 19 (3), pp. 184-206.

227 Petter, S., & Fruhlingb, A. 2011. Evaluating the success of an emergency response medical information system. *International journal of medical informatics*, 80 (7), pp. 480-489

228 Seddon, P.B., 1997. A Respecification and Extension of the DeLone and McLean Model of IS Success

229 Visser, M., Biljon, J. V., & Herselman, M., 2013. Evaluation of management information systems: A study at a further education and training college. *SA Journal of Information Management*, 15 (1).

230 Patterson, A. 2005. *Information Systems - Using Information. Learning and Teaching*. Scotland.

231 Caniëls, M. C., & Bakens, R. J., 2012. The Effects of Project Management Information Systems on Decision Making in a Multi Project Environment. *International Journal of Project Management*, 30 (2), pp. 162-175.



system or systems being evaluated and their purposes. Rather than complicate the model with more success measures, it is preferable to move in the opposite direction and group all the “impact” measures into a single impact or benefit category called “net benefits.” Although, for some studies, such finer granularity may be appropriate, further such refinements were resisted for the sake of parsimony.

Based on a comprehensive literature review, Namani<sup>232</sup> measured organisational benefits derived from IS projects. Their measurement framework consisted of three categories of organisational benefits: strategic, informational, and transactional. The proposed instrument was empirically tested in a survey of 200 IS managers and systems analysts. The results showed strong evidence of discriminant validity. Further analysis identified three sub-dimensions for each of the benefit categories. Strategic benefits were further subdivided into competitive advantage, alignment, and customer-relations benefits. Informational benefits included information access, information quality, and information flexibility sub-dimensions; and finally, transactional benefits included communication efficiency, systems development efficiency, and business efficiency sub-dimensions

Information is the basis for economic decisions within the whole value chain, making enterprises dependent on the implementation of modern IS to stay competitive, e.g. by enabling real-time data access or providing business intelligence functions. Simultaneously, the amount of business realms using sophisticated IS rises: among others, IS comprises e-commerce systems, knowledge management systems, and decision support systems.

In this context, measuring what makes an IS successful is of utmost importance. However, no consensus exists among practitioners and academics, on how to measure the success of IS. Therefore, many success models have been developed, complicating the validation and comparison of the antecedents of IS success. Although previous research on IS success has found three models to be predominant: the IS success model proposed by DeLone and McLean (D&M) success model, which is the most widely used IS success model, the updated D&M success model was chosen in this study.

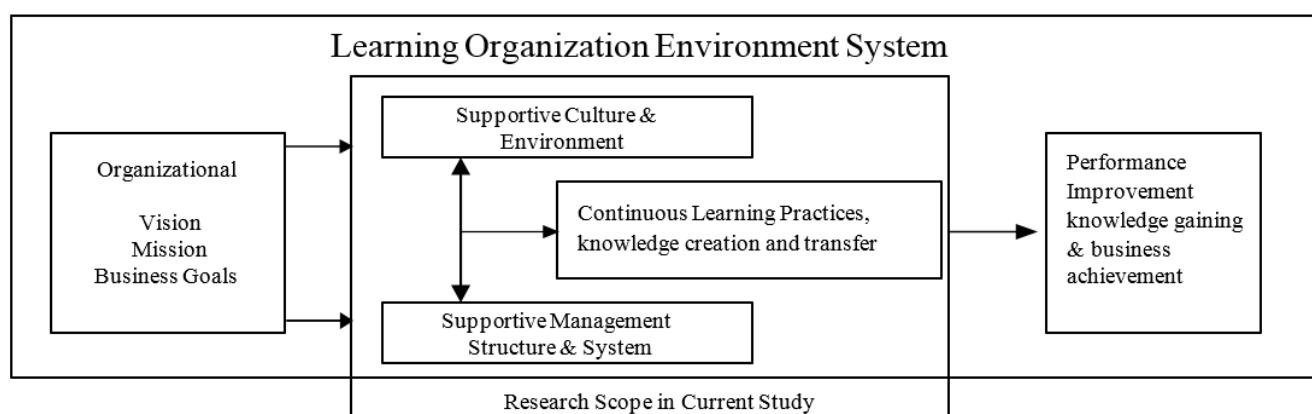
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232 Namani, M. B. 2010. The role of information systems in management decision making-a theoretical approach. *Information management*, 109-116.

### 3.6 Literature Analysis

This section combines the key theoretical reviews to allow for development of a summary statement that unifies the literature as much as possible. The focus of this section is on learning organisation culture and information systems success models which are the anchor of this study.

A number of insights can be drawn from the various definitions and conceptualisations about a learning organisation. Analytically, various scholars showed similarities among various lines of definitions and understanding a learning organisation. These include the learning environment-related factors, the continuous learning process within the organisation; the system-oriented learning structure, the autogenously learned and knowledge creation environment, and the performance and goal-oriented learning systems. These commonalities are related as presented in the Figure 3.6 below. Along these lines, the collaborative learning-oriented organisational cultures are associated with the major learning processes, which include individual learning, learning and knowledge transfer, knowledge management systems, and collaborative organisational learning culture.<sup>233</sup> To take advantage of learning-based performance improvement in organisations, it is clear that the establishment of a learning oriented culture is critical.<sup>234</sup> Thus, in the views of Pai and Huang,<sup>235</sup> it can be asserted that the learning organisation is the fundamental culture and structure for taking the market advantages through the performance improvement.



233 Shim, J. K., 2000. Information system and technology for the non-information systems.

234 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1), pp. 5-22.

235 Pai, F., & Huang, K. 2011. Applying the Technology Acceptance Model to the introduction of healthcare information systems. *Technological Forecasting and Social Change*, 78 (4), 650-660.

Figure 3.6-Learning organisation system and its basic components<sup>236</sup>

In a scholarly perspective, even though several research studies regarding the concept of the learning organisation and applications of the DLOQ, have been conducted in various countries few of those studies have accomplished the structural validation processes to measure acceptability and applicability of the instruments in the culture.<sup>237, 238</sup> Therefore, in attempting to examine the validity and reliability of DLOQ scores in a country of study, focus should be on evaluating the applicability of the instrument in the national culture. Hence, the successful application of learning organisation strategies and standardised measures of the learning organisation characteristics may prove substantially helpful to organisations trying to instill continuous learning practices.

Even though there is wide acceptance of the benefits of becoming a learning organisation, there are still clear gaps that need further investigation. To begin with, it is surprising that the concept has not been popularised in all continents across the globe. Evidently, little is known about African and Asia-Pacific organizations vis-à-vis learning organisations.<sup>239</sup>

Critically, the reviewed literature indicated that most of the studies on the concept of learning organisations have concentrated on other parts of the world not on Africa. <sup>240, 241, 242, 243</sup>

Research on the impact or the benefit of becoming a learning organisation has been increasing since the 1990s with the publication of Senge's book, *The Fifth Discipline*.

There are three key conclusions that can be drawn from a number of studies presented in this research assignment. First, it can be deduced that Watkins and Marsick's Dimensions of the

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236 Song, J.H. and Chermack, T.J., 2008. Assessing the psychometric properties of the Dimensions of the Learning Organization Questionnaire in the Korean business context. *International Journal of Training and Development*, 12(2), pp. 87-99.

237 Jang, J. A., J., Kim. S., and Kim, D. J., 2001. *Business Education Research*, 3(1), 77-98.

238 Song, J. H., Kim, J. Y., and Kim, Y. S., 2007. Contextual integration of learning organism theories: There is no configuration, but are they same? *Academy of Human Resource Development Conference proceedings*: 1161-1168

239 Al-adaileh, R. M., 2009. An Evaluation of Information Systems Success: A User Perspective - the Case of Jordan Telecom Group. *European Journal of Scientific Research*, 37 (2), 226-239.

240 Jang, J. A., J., Kim. S., and Kim, D. J., 2001. *Business Education Research*, 3(1), 77-98.

241 Song, J. H., Kim, J. Y., and Kim, Y. S., 2007. Contextual integration of learning organism theories: There is no configuration, but are they same? *Academy of Human Resource Development Conference proceedings*: 1161-1168

242 Mason, R.O., 1978. Measuring information output: A communication systems approach. *Information & Management*, 1 (5), pp. 219-234.

243 Hasan, Y., Shamsuddin, A.A. & Aziati, N., 2013. The Impact of Management Information Systems Adoption. *Managerial Decision Making: A Review. Management Information Systems*. 8 (4):010-017

Learning Organization Questionnaire (DLOQ) produces valid and reliable scores of cultural context. Second, by conducting this research, there will be credibility of previous research studies and practical applications of the DLOQ in the national context that have overlooked the need to examine whether the instrument is appropriate in the cultural context of a country such as Zambia for example. Third, there will be a strong foundation for future studies in the country's organisations that are intent on developing learning cultures and internal systems to support ongoing learning in the hope of fostering creativity and performance.

An additional general conclusion is that a number of studies have added to the growing body of research examining the DLOQ by Watkins and Marsick. In theory building terms, continued research studies using the DLOQ seem to confirm the assumptions and conceptualisation of the learning organisation offered by Watkins and Marsick. As Human Resource and Development (HRD) increasingly concerns itself with theory and theory construction in the social sciences, examples of theory construction that come directly from HRD professionals will be increasingly useful.

Finally, the practical implication of the literature is that the DLOQ produces accurate and reliable measures of learning organisation culture. Thus, its utility goes beyond academic research, and the DLOQ should be thought of as a useful means for obtaining information about an organization's learning culture. Here, the consultants might consider taking a "reading" from the DLOQ to determine how the organisational members view the culture before implementing a major change effort.

From the research conducted by Marsick et al.<sup>244</sup> and Ramani<sup>245</sup>, it can be seen that there is a correlation between measuring organisational performance against the dimensions of the learning organisation and knowledge. Hence, financial performance of an organization can be established. Subsequent studies by Ellinger, Ellinger, and Keller,<sup>246</sup> Visser et al.<sup>247</sup>, as well

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244 Marsick, V.J. and Watkins, K.E., 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire. *Advances in Developing Human Resources*, 5(2):132-151

245 Namani, M. B. 2010. The role of information systems in management decision making-a theoretical approach. *Information management*. 109-116

246 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1): 5-22

247 Visser, M., Biljon, J. V., & Herselman, M. 2013. Evaluation of management information systems: A study at a further education and training college. *SA Journal of Information Management*, 15 (1).

as Davis,<sup>248</sup> using actual organisational data regarding performance confirmed such relationship between the dimensions of a learning culture and overall knowledge and financial performance. Such performance metric can be observed irrespective of whether or not an organisation is a profit, non-profit, business, or government <sup>249,250, 251, 252, 253</sup>. Analytically, the dimensions of a learning culture explain much of the variance in the two organisational outcome variables, notably knowledge and financial performance. Arguably, this can vary based on a number of factors: - such as organisational size, access to raw materials, market niche, or competition.

Despite studies validating the use of DLOQ in various national contexts, a comparison with similar studies also needs to be made based on other parts of the world. This will help to support the applicability of the DLOQ in different cultural settings. The findings of such studies, if found to be consistent with other studies in a different cultural setting from the original cultural environment of the authors, will help to further validate the use of DLOQ. In such validations, a closer look should be taken at the recent findings by Song et al.<sup>254</sup> as well as other research that used the DLOQ to assess learning organisation culture or practice. While comparing the Western culture and the Eastern culture, some recent studies have been done by Jang, Kim and Kim,<sup>255</sup> as well as Zhang et al.<sup>256</sup> which reported that the DLOQ is applicable in Korea. The authors tested and validated the DLOQ in China and Nath and

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248 Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13 (3), 319-340.

249 Marsick, V.J. and Watkins, K.E., 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire. *Advances in Developing Human Resources*, 5(2):132-151

250 Namani, M. B. 2010. The role of information systems in management decision making-a theoretical approach. *Information management*. 109-116

251 Ellinger, A.D., Ellinger, A.E., Yang, B. and Howton, S.W., 2002. The relationship between the learning organization concept and firms' financial performance: An empirical assessment. *Human Resource Development Quarterly*, 13(1): 5-22

252 Visser, M., Biljon, J. V., & Herselman, M. 2013. Evaluation of management information systems: A study at a further education and training college. *SA Journal of Information Management*, 15 (1).

253 Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13 (3), 319-340.

254 Song, J. H., Kim, J. Y., and Kim, Y. S., 2007. Contextual integration of learning organism theories: There is no configuration, but are they same? *Academy of Human Resource Development Conference proceedings*: 1161-1168

255 Jang, J. A., J., Kim. S., and Kim, D. J., 2001. *Business Education Research*, 3(1), 77-98.

256 Landrum, H. T., Prybutok, V. R., Strutton, D., & Zhang, X., 2008. Examining the Merits of usefulness Versus use in an information service Quality and information system success Web-based Model. *Information Resources Management Journal*. 21 (2)

Badgujar,<sup>257</sup> reported the applicability of the DLOQ in Iran.

Apart from learning organisation, a number of insights can be drawn from the literature on the D&M IS Success Model. Evidently, the DeLone and McLean Model of IS Success is widely-cited in the IS literature. This is because of its positive contributions to various organizations and sectors. In view of a number of literature sources, it can be deduced that the basic contributions of the model are important to the IS researchers. This is because it provides a classification for all the evaluation measures that have been reported in the IS literature. The model also commences to identify potential stakeholder subjects to be evaluated. Additionally, the model suggests how the constructs may interact with each other. However, all these do not signify that the model is perfect, as supported by some researchers.<sup>258</sup> This is because a model just depicts a theory to help the researcher put the data in a framework, thereby making it easier to understand and explain.

Therefore, the conditions issued by DeLone and McLean offer much sense to the successful and appropriate use of their model. In this view, it can be noted that a number of studies on DeLone and McLean's model did not adhere to the recommendations of the initial scholars of the model. Hence, this can make their opposing views on the validity of the model null and void. DeLone and McLean's model is significant for the researchers that attempt to utilise it to fulfil a number of conditions.

First, to be able to compare studies that utilise the IS success model the studies need to coincide in the use of the same or very similar measures for each one of the dimensions specified in the model. The researchers need to consider the connections between the dimensions of the IS success model because all the dimensions are interrelated. In this view, the literature revealed that some scholars used the model partially, and hence this could not yield the same results as studies that used the model as a whole. It is therefore clear that conflict in the literature on the validity and universality of DeLone and McLean's model stems from the way researchers use the model but not in the model constructs. Additionally, it is important that researchers using the model ensure that the model is studied at the appropriate level of analysis. Here, the study may want to examine individual measures of

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257 Nath, R. P., & Badgujar, M., 2013. Use of Management Information System in an Organization for Decision Making. *ASM's International Journal of Ongoing Research in Management and IT*, 2 (6), pp. 160-171.

258 Rai A, Lang S.S and Welker R.B. 2002. Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*.13(1): 50-69

success, in which case, all measures involved in the model should be at the individual level. Nonetheless, it is necessary to test the model at all levels of analysis to ensure that it is a representation of a comprehensive model of IS success and thus can be used to explain data at all levels.

Basically, it can be deduced that the original paper on the model expressed various views. First, the multidimensional and interdependent nature of IS success requires careful attention to the definition and measurement of each aspect of the dependent variable. On this note, it is significant to measure the possible interactions among each of the success dimensions in order to isolate the effect of various independent variables with one or more of the dependent success dimensions. The selection of IS success dimensions as well as measures needs to be contingent on the objectives and context of the empirical investigation.

In addition to the publications that have cited and used the D&M IS Success Model, it is evident that many studies have been published, which directly or indirectly validate, challenge, critique, or extend the model. On a balance, such additional publications have contributed to a better understanding of IS success and its dimensions.

In view of this research, it appears that the creation of the D&M IS Success Model was driven by a process of understanding of information systems and their impacts. In the insightful view of various literature sources, a process model has three components: (i) the creation of a system (ii) the use of the system, and (iii) the consequences of this system use. Analytically, each of these steps is a necessary though not sufficient condition for the resultant outcome(s). Here, it should be noted that without system use, there can be no consequences or benefits. Contrastingly, with system use, even extensive use, which is inappropriate and/or ill-informed, there may also be no benefits. Therefore, there should be a balance to fully understand the dimensions of IS success

### **3.7 Conclusion**

The chapter has presented a theoretical and empirical review of literature, identifying the theoretical frameworks that underpin the research study. The different theoretical frameworks were identified and discussed giving a balanced view of the existing knowledge in the fields. A literature analysis was provided to logically summarise the areas within the knowledge base that are most relevant to the research study, aligning the arguments to the aim of the research study and explaining where and how the current research will contribute to the knowledge base. Finally, Chapter 3 has contributed to fulfilling the objectives of the study by

reviewing the theoretical frameworks to be used as lenses to explain the case under study. The next chapter discusses the methodology and instrument design for the present research study.



# *Chapter 4*

# Methodology and Instrument Design

## **4.1 Introduction**

The previous chapter provided a theoretical review of the major framework for the research. This chapter outlines the mixed methodology used for this study. This approach consists of qualitative and quantitative methods. These were applied during in the research study to gain breadth and depth of data collected about a learning organisation culture and information systems quality variables. The research design was centred on the theoretical review, research model and hypothesis discussed in Chapter 3.

Chapter 4 is structured as follows: - Firstly, it explores the research paradigm and mixed method research design, its suitability for the present study and the research population. Then it explains the qualitative research method, semi-structured interviews data collection method used, population, sample, process related to data gathering, procedure related to evaluating data and limitation of the procedure. Thereafter, it discusses the quantitative research method, survey questionnaire data collection method, population, sample and sampling methodology employed, process pertaining to gathering of data, the tests used for reliability and validity of data, data analysis and limitation of the methodology. The chapter concludes with a brief summary.

## **4.2 The Mixed Methods Research Design**

### **4.2.1 The Research Paradigm**

The field of research employs scientific approaches to verify or create of knowledge. It is for this reason that two possible forms of scientific research exist, namely inductive research,

where the goal is about development of theory through observed data and then deductive research where the concepts and patterns known from theory are tested using new empirical data.

Bryman<sup>259</sup> discussed a little more on this subject by referring to research based on the 'Inductive Approach' basically involving arrival at a general conclusion on the basis of observations. The approach also consists of a link between observations of a theory that pertains to observed findings.<sup>260</sup> Yet, in the 'Deductive Approach' a researcher has to create a hypothesis on the basis of known research, then develop hypotheses and test the performance on the basis of practical application of knowledge. Deductive study is based on the premise of logic a hypothesis needs to be developed skilfully and then related to operational terms.

As regards the current study, the researcher used the deductive approach as one part of analysing the learning organisation culture and information systems quality while slowly moving in the direction of empirical evidence of the same. The researcher followed a deductive approach with theory-based conditions of an applied research problem, in addition to empirical measurement and proper data analysis. The research for this study was based on prior knowledge on which the researcher developed the hypotheses.

#### **4.2.2 Research Approach**

Research approaches differ and can generally be categorised as quantitative, qualitative or mixed methods. This study was appropriate for using a mixed research methodology in order to depth of insight into data about learning organisation culture dimensions and information systems quality relationships. The study used triangulation of findings of qualitative research methodology to cross check with results of the quantitative research methodology. The data gathered from interviews assisted with the development of the questionnaire. Whilst each methodology has advantages and disadvantages, the mixed methodology optimises the advantages and minimises the disadvantages offered by each methodology.

The researcher made use of two approaches to work out this method: Qualitative approach and the quantitative method. The qualitative approach is the thought-process of an inductive view of theory and research, which in turn leads the research to a conclusive theory. However, there are some drawbacks of this approach. Data collected by the qualitative approach could be subjective or biased. There could also be a lack of transparency in data

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259 Bryman, A. 2001. *Social research methods*. Oxford: Oxford University Press.

260 Bryman, A. 2001. *Social research methods*. Oxford: Oxford University Press.

selection. It is for this reason that the quantitative approach was used as well.

Myers<sup>261</sup> believes that a quantitative approach is followed when results are to be quantified and also when there is a large sample size or population. This approach is basically a numerical approach of which the major drawback is data richness and a predominantly generalised view.

#### **4.2.3 Research Strategy**

There are various research strategies that exist. Positivist and phenomenological research strategies were used in this study.

Positivist research strategy upholds a common belief that the world is not only external but is also objective and that science is value free. This was used in quantitative methodology approach. Positivist research strategy tends to focus on facts and the researcher using positivist research strategy normally looks for causality and fundamental laws. It is also important that the phenomenon is reduced to sample elements when using positivist research strategy. In this research strategy, hypotheses were formulated and tested accordingly in a bid to address the research problem. Besides, in positivist research strategy, concepts are operationalised in order to be measured. The strategy also requires large samples in order to be applied correctly. This was applied in the quantitative methodology for this study.

Phenomenological research strategy is where a researcher makes an inquiry to identify the essence of human experiences of phenomena as described by participants.<sup>262</sup> The strategy involves the use of enquiry phrases like 'how', 'why', and 'what' among others. The strategy adopts specific reference to an individual's experiences, feelings, opinions, and thoughts regarding the phenomena. This research strategy was used in qualitative methodology approach. Phenomenological research strategy enable researchers to examine experiences as well as sensory perception of researched phenomena and formation of understanding based on experiences and perceptions. The phenomenological research strategy therefore is biased. Phenomenological research strategy views the world as socially constructed and subjective and the observer is part of what is observed. This strategy tends to focus on meanings in order to understand what is happening. The research using the phenomenological research strategy tends to use a number of methods in order to find out different views of phenomena. The

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261 Myers, M. 2009. *Qualitative Research in Business and Management*. London: Sage Publications Ltd.

262 Zikmund, W. G. 2003. *Business research methods*. Cincinnati, OH: Thomson/South-Western

research uses small samples, which are investigated in depth.<sup>263</sup> The research strategy was applied in the qualitative methodology used for this study. The advantage of using phenomenological research included the fact that the design provided very rich and detailed descriptions of experience and was key in achieving the objectives of the research. In addition, phenomenological research played a significant role in ensuring that the results emerged from that data instead of being imposed by a structured statistical analysis.

#### 4.2.4 The Unit of Analysis

The target of the investigation or unit of analysis was the organisation.<sup>264</sup> As individuals and teams make decisions on behalf of the organisation as part of their day to day jobs, they formed a key focus of the investigation.

#### 4.2.5 The Research Population and Sample

The research population for the study was 1,131 and constituted of junior and senior employees who use an information system and were recruited from Lumwana rural society. Purposive sampling technique was used to identify the respondents. The purposive sampling is where a researcher chooses respondents from the identified sample population.<sup>265</sup> The judgement of the researcher is important in this case since the individuals chosen should represent the population under investigation. The sample size for the quantitative data in this research was determined to be 100.

Qualitative data was collected from the population through a sample of 11 respondents by means of a pre-survey interview and five respondents for follow-up interviews after the survey. Simple random sampling was used in identifying the people to interview.<sup>266</sup> The experience of the respondents about the phenomenon was collected through follow up interviews to establish their experience concerning the relationship between learning organisation culture and information systems quality at Lumwana mine.

### 4.3 The Qualitative Study

The qualitative research is based on phenomenological research paradigm where the

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263 Zikmund, W. G. 2003. *Business research methods*. Cincinnati, OH: Thomson/South-Western

264 Bhattacharjee, Al, "Social Science Research: Principles, Methods, and Practices" (2012). USF Open Access Textbooks Collection. Book 3. Accessed on 20th May 2015 , Page 9  
[http://scholarcommons.usf.edu/oa\\_textbooks/3](http://scholarcommons.usf.edu/oa_textbooks/3)

265 Neuman, W. L. 2011. *Social Research Methods: Qualitative and Quantitative Approaches*, 7th edn, Pearson/Allyn and Bacon, Boston

266 Saunders, M., Lewis, P., & Thornhill, A. 2003. *Research Methods for Business Students* (3 ed.). Essex: Pearson Education

qualitative analyst presumes that the most suitable manner to investigate a specific scenario is to analyse it from the perspective of the individuals related to the problem. This investigative technique is most suitable in scenarios where investigative data can be gathered with and evaluated with a high level of partiality. Conducting a qualitative analysis leads to gathering comprehensive and rich data in addition to increasing comprehension. Qualitative research produces much more detail and potential understanding. The data collection methods used for this research method include case studies, subjective questionnaires, structured interviews, semi-structured interviews and focus groups.

#### **4.3.1 Data Collection Procedure**

The qualitative data collection process was carried out in two stages. These are pre and post survey.

In the pre-survey stage, secondary data was gathered through reviewing the social impact assessment, training policy, IT strategy documents etc. Further, semi-structured interviews were used as a source of primary data. This resulted in the development of the case study of Lumwana Mining Company which is discussed in Chapter 3. The case study was used as an evidence collection procedure in answering the research question. The evidence was analysed from both the phenomenological perspectives.<sup>267</sup> The semi-structured interviews enabled the researcher to obtain views of community members, operators, supervisors and managers on background of major source of recruitment i.e. chiefdoms, learning organisation culture and information systems quality. It gave the researcher an opportunity to explore the social reality of the background environment of many information systems users and learning processes at Lumwana Mining Company. The knowledge and results gained from the semi-structured interviews contributed to the development of the questionnaire.

In order to ensure that the interviews were done in a manner that helps to obtain the required information, a case study protocol was used. This was for the purpose of evidence collection and managing themes of the interviews.<sup>268</sup> The interview guide themes or sections for questioning were derived after reviewing the theoretical frameworks which have been discussed in Chapter 3. The questions for the interview guide were arranged to address the objectives of the research.

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267 Remenyi, D., Williams, B., Money, A. & Swartz, E. 2000. *Doing research in Business and Management*. London: Sage Publications., P 164

268 Remenyi, D., Williams, B., Money, A. & Swartz, E. 2000. *Doing research in Business and Management*. London: Sage Publications., P 165

### a) Field Procedures

Eleven employees were interviewed during the pre-survey stage in order to develop the case study. These employees were randomly selected from various departments. The interviews were the primary source of information for the case study. Some other secondary sources of data that were useful to compile the case study include:-

- (i) Lumwana Social Impact Assessment- enabled the researcher to collect information about the background of Lumwana society before the establishment of the mine. This was useful in evaluating and putting Lumwana society within the framework of the stages of development as discussed by Rostow modernisation theory<sup>269</sup>
- (ii) Lumwana Environmental Impact Assessment- This document complemented the social impact assessment and had the focus on the environmental set up and impacts of the mine within Lumwana rural society.
- (iii) Lumwana IT Strategy-detailed the situation analysis, technology strategies based on the business value chain and focus areas for information systems success which results in value generation for the organisation.
- (iv) Lumwana Training Policy-described the training needs assessment process, individual development interventions such as on the job training and company sponsored vocational training. This was key in understanding learning processes that exists at Lumwana mine.
- (v) Information System Project Documentation-provided historical information on different systems implemented and the learning processes used as part of technology acceptance.

### b) Case Study Questions

Having reviewed the secondary data, the following questions were asked used during the interviews. The objective was to affirm the information gathered through secondary data and further to collect additional information in other relevant areas.

- (i) What is the location of Lumwana Mining Company?
- (ii) What are the political, educational, economic and social facets of the Lumwana Mining Company's external community?

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269 Rostow, W. W. 1960. Stages of economic growth: a non-communist manifesto. Cambridge U.P.

- (iii) What is the Lumwana Mining Company's internal business value chain?
- (iv) What is the Lumwana information system enterprise architecture like?
- (v) What is the IT department structure like?
- (vi) What Systems are supported by the IT department?
- (vii) What is the learning process and culture around information systems such as Oracle Human Resource Information System, Modular, and Intranet?
- (viii) To what extent does Lumwana Mining Company's learning culture at individual, team or group and organisation level influence the following:-
  - a. Information quality?
  - b. System quality?
  - c. Service delivery quality?

#### **c) Follow up Interview Questions**

After the survey, the follow-up interviews were conducted with five employees. The purposes of the interviews were to clarify aspects of the data that had been collected via survey questionnaire method. This was done using the verbatim method. The following questions were posed to the selected employees.

- (i) What trainings or qualifications she/he had pursued since joining Lumwana? This question sought to clarify continuous learning among employees recruited from Lumwana rural society.
- (ii) Did the knowledge acquired through upgrading qualifications support him/her to be promoted to senior career? Through responses to this question, acquisition of knowledge from continuous learning was analysed by comparing career growth in the organisation and impact on information systems.
- (iii) Which system she/he preferred to use-in house developed or outsourced and why? The purpose of this question was to assess technology acceptance and user experience for in house versus outsourced systems.

#### **4.3.2 Population and Sample of Interview**

The population selected comprised of 1131. As stated before, the population was restricted to individuals who have access to information systems and were employed from the local community. A list of 100 employees working in Lumwana Company was obtained from the

human resource information system. A simple random sampling was done to obtain a total of 11 employees. The number of employees was regarded as sufficient because they were considered representative of all the members of the population. The respondents were listed after obtaining the consent from the company to allow them to take part in the interview. After creating a listed based sampling frame, a random number generating process was used to obtain the 11 respondents from the list of 100 employees.

A selection method of equal probability was used to identify 11 employees who could be interviewed. An online random number generator known as Stat Trek was used to generate 11 numbers from a sample population of 100 employees, which was numbered from 1-N where N was 100. The random numbers generated are stated below

02, 266, 113, 34, 158, 17, 186, 43, 222, 102

From the list of 100 employees who were listed in alphabetical order based on their surname, 11 respondents were selected. After obtaining the numbers which were randomly generated, the employees whose surname corresponded with random numbers 02, 266, 113, 34, 158, 17, 186, 43, 222, 102 made up the selected sample population that participated in the research. Permission to participate was first sought from every employee who formed part of the listing. They were contacted by email or by phone to seek their consent for an interview.

#### **4.3.3 Data analysis process**

From both pre-survey and follow-up (post-survey) interviews, there were transcriptions which were analysed by using content analysis.<sup>270</sup> Specifically, thematic content analysis was used. This involved a review of the transcripts and taking note of recurrent topics, descriptive coding, interpretative recording and development of emerging themes. Primary data collected using the interview transcripts was analysed in stages which included interim analysis, summarising the main points emerging from the interview, using interview summaries to develop the case study. An interview summary sheet was created for each individual interview followed by summarising the main points emerging from the interview and referencing the same to the text of the interview.<sup>271</sup>

#### **4.3.4 Limitation of Qualitative Methodology**

The qualitative research methodology had some limitations. The researcher is an employee of

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270 Cooper, D.R. and Schindler, P.S. 2006. *Business Research Method*. Boston: McGraw-Hill Irwin.

271 Saunders, M., Lewis, P. & Thornhill, A. 2007. *Research methods for Business Students*, 4<sup>th</sup> Ed. Harlow, England: Pearson Education Limited



Lumwana Mining Company, working as an Information Technology Superintendent. Although the researcher had access to as much information as possible for the research, there may have been some bias. However, this was overcome by the researcher employing professional research ethics and avoiding familiarity during data collection. The research also faced some limitations in terms of the research questions, geographical location, time and financial resources. Due to inadequate resources the research did not have a wide scope like interviewing up to 500 respondents for instance, since that would have cost a lot in terms of finance and other related resources which were not at the disposal of the researcher. Interviewing such a large population requires a lot of financial resources in order to cater for logistical expenses among others and therefore the lack of financial resources was a limitation of the research. In addition, time was a limiting factor of the research study because the research had to be completed within a specific period. As a result, it was necessary to adjust the scope of the study such that the available time would be adequate to complete the whole study successfully. The scope of the research study was also determined by the research questions since the study could not investigate anything outside the research questions.<sup>272</sup> Since primary data was collected from respondents working at Lumwana Mining Company in Zambia, it follows that the research was therefore limited by geographical locations as data was collected from one specific geographical location only.

#### **4.4 The Quantitative Study**

Quantitative research which is mostly associated with the positivist research paradigm is concerned with treatment of data which can be gathered and evaluated with a high level of impartiality. The investigative technique presumes that the study data may be gathered and evaluated in a neutral manner. This approach makes use of numerical data which can be primary or secondary in nature. The quantitative methodology is very appropriate for hypothesis-based research, produces definitive results, can be appropriate for showing relationship between two or more variables and uses objective measures.

The data collection method that was used was a survey.

##### **4.4.1 Data Collection Procedure**

The quantitative aspects of the study involved the use of a survey questionnaire. This was done in two parts. First, a pilot survey was done on ten employees. The results from the pilot

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272 Saunders, M. 2009. *Research Methods for Business Students*. Harlow: Pearson Education

survey enabled the researcher to further refine the questionnaire, include counter questions and others on processes and systems. The final survey was sent out to 100 employees who were selected using random sampling from the selected population to obtain a broad view of learning organisation culture dimensions and information system quality. The same online random number generator called Stat Trek which was used for generating the numbers for qualitative method was used to select 100 employees from a population of 1131. The survey questionnaire was chiefly employed as it was easier to use. The questionnaire was completed by each participant in confidence with no names indicated. The other advantages with this data gathering technique is comprised of it being flexible in planning and arrangement.<sup>273</sup> The main problems included lack of 100 percent response and coverage.<sup>274</sup>

#### 4.4.2 Design of the Questionnaire

The survey questionnaire consisted of four parts, namely demographics, learning organisation culture, information systems quality and processes and systems sections.

The first part of the questionnaire was a demographics section. The purpose of this section was to collect data about the target audience member(s). Specific questions were asked about the job level, department, information system used, staff category, department, experience and education background. This information was used for analysing technology acceptance, organisation learning and information systems quality. Further, as some departments use specific information systems and have similar education background, this information was gathered through responses to these questions. The education background question was used to cross check any individual continuous learning that has taken place since joining Lumwana mine so as to compare to the general level of education before the establishment of the mine. Most of the people recruited from Lumwana society were junior staffs. The staff category assisted to analyse if some of them had been promoted to senior staff category. These questions were key in interpreting modernisation stages by Rostow. Section A covered questions 1-6.

The questions on learning organisation culture using Dimensions of Learning Organisation Questionnaire (DLOQ) created by Watkins and Marsik<sup>275</sup> are discussed in section 2. These

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273 Weible, Rick, Wallace, John, 1998. - The impact of the internet on data collection. *Marketing research: a quarterly business management publication of the American Marketing Association.*, **10**(3), pp. 19.

274 Dillman, Don A., 1978. *Mail and telephone surveys: the total design method*. New York: Wiley.

275 Marsick VJ, Watkins KE. 2003. Demonstrating the Value of an Organization's Learning Culture: The Dimensions of the Learning Organization Questionnaire. *Advances in Developing Human Resources*, **5**(2), pp. 132-151.

questions are based on the modified 21 items on a four-point Likert-type scale which were used to measure the seven dimensions of DLOQ. The respondents were requested to ascertain the degree to which each of the queries echoed the organisations pertaining to the learning culture (1 \_ strongly disagree; 4 \_ strongly agree). The questions measured individual, team and organisational level variables as they pertain to organisation learning. The variable continuous learning was contained in question 1, inquiry and dialogue in question 2, team learning in question 3, embedded system in question 4, system connection in question 5, empowerment in question 6, leadership in question 7 and another one on system connection in question 8. Counter questions, 9-10 were included to check the quality of responses and validation purposes.

The third section of the questionnaire was about information systems quality. This was assessed using information systems quality concepts i.e system quality, information quality, service quality. These were customised based on the Delone and Mclean Information Systems Success model. The indicator variables used for information systems quality were adapted from the data collection instrument by Gorla et al. <sup>276</sup> According to this questionnaire, questions 11-12 were indicator variables of content and format and were used to measure information quality. System quality was gauged by two values, adaptability and complexity. This was in question 13-14. There were four pointers to measure service quality namely dependability, sensitivity, guarantee with three items, and understanding and were from 15-16. The averages of the questionnaire items pertinent to those pointers were used to calculate the information system quality concepts. The participants had to respond to a 4 point scale (1 = strongly disagree, 4 = strongly agree) in context of their general viewpoint pertaining to the information systems they frequently use at work. Counter questions, 17-20 were included to check the quality and validate the responses.

The last section of the questionnaire collected information about processes and systems. For instance, statement A discussed the experiences of the respondent with regard to adapting to processes at Lumwana mine. With processes that are far advanced compared to agriculture development stage which the majority would have been used to, the response to the question was used to gauge the continuous learning and adaptation to change which is a key part of a learning organisation culture. The other question on technology learning processes and adaptation was in statements B, C, D and E. By selecting yes or no, this would be used to

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276 Gorla, Narasimhaiah, Somers, Toni M., Wong, Betty, 2010. Organizational impact of system quality, information quality, and service quality. *Journal of Strategic Information Systems*, 19(3), pp. 207-228.

explain BI (Behavioural Intention to use) which is determined by person's attitude toward the system (A) and perceived usefulness (U).<sup>277</sup> The leadership dimension of organisation learning is interpreted by the way the respondent gave feedback on general business process and organisation questions in statement F and statement G.

In summary, below is the questionnaire that was used to collect quantitative data for this research.

### SECTION 1: BACKGROUND INFORMATION

1. Which Information System do you use frequently?

Modular PC  Intranet  Oracle  Pronto  Graphical Console System  Other

2. What is your gender?

Male  Female  Other  Opt out

3. What is your employment category

Management  Senior  Junior  Opt out

4. What is your highest qualification

Certificate  Diploma  Degree  High School Certificate  Above Degree  Opt out

5. What department do you belong to

Mining

Process

Commercial

Human Resources

Sustainability

Security

Technical Services

Maintenance

Health and Safety

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277 Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1003

Environment

6. What are the total number of years working at the mine

Less than a year    1-5 years    More than 5 years    *Opt out*

**SECTION 2: STATEMENTS ABOUT ORGANISATION LEARNING CULTURE**

In this section there are a number of statements.

You are requested to express your experience by marking a X in the column of your preference in each case. The scale is:

- 1      **No I *strongly disagree*** with the statement
- 2      **No I *disagree*** with the statement
- 3      **Yes I *agree*** with the statement
- 4      **Yes I *strongly agree*** with the statement

Note: it may happen that you have no experience of a specific statement. In such a case please tick the *Opt Out* column on the right.

	STATEMENT	1	2	3	4	Opt out
1	I continue to learn about the system as I use it					
2	I am given open and honest feedback by my friends about the system I use					
3	I ask my team members when I encounter difficulties and they offer help					
4	I recommend improvements and the organisation acts on them					
5	I am rewarded for being a good performer and taking initiative					
6	I am encouraged to ask and seek answers when I do not understand					
7	I am encouraged by my supervisors to be a brother's keeper					
8	I believe work meetings add value in learning how system information is used by the organisation					
9	I do not get help from co-workers to learn about the system					
10	My suggestions on how to improve learning about the system are not accepted					

**SECTION 3: NEXT EVALUATE STATEMENTS ABOUT INFORMATION SYSTEM QUALITY**

In this section there are a number of statements.

You are requested to express your experience by marking a X in the column of your

preference in each case. The scale is:

- 1 **No** I *strongly disagree* with the statement
- 2 **No** I *disagree* with the statement
- 3 **Yes** I *agree* with the statement
- 4 **Yes** I *strongly agree* with the statement

Note: it may happen that you have no experience of a specific statement. In such a case please tick the *Opt Out* column on the right.

	STATEMENT	1	2	3	4	Opt out
11	The system produces readable information					
12	The information needed from the system is available					
13	The system is easy to learn					
14	The system responds quickly when using it					
15	The system support team helps with system problems					
16	The system support team has knowledge to do their job					
17	The system does not produce the required information					
18	I had difficulties learning how to use the system					
19	I experience difficulties when accessing the system					
20	I do not get support for the system from IT when I encounter problems					

**SECTION 4: STATEMENTS CONCERNING PROCESSES AND SYSTEMS**

In this section there are a number of statements, followed by a number of options to respond to the statement.

You are requested to choose the response that satisfies you most, and to indicate your choice with a X in the corresponding block.

Note: it may happen that you have no experience of a specific statement. In such a case please tick the *Opt Out* column on the right.

**Statement A**

**Choose one below**

It was easier for me to adapt to work processes and schedule at the mine	Yes	
	No	
	Opt out	

**Statement B**

**Choose one below**

Whilst working, I have appreciated technology and want to learn more	Yes	
	No	
	Opt out	

**Statement C**

**Choose one below**

I believe learning about information systems has added value to my career	Yes	
	No	
	Opt out	

**Statement D**

**Choose one below**

I would encourage any person to join my organisation because of the learning opportunities about technology that exists	Yes	
	No	
	Opt out	

**Statement E**

**Choose one below**

I believe the information obtained from the system(s) adds value to decision making	Yes	
	No	
	Opt out	

**Statement F**

**Choose one below**

The process of plan, act, control and improve is useful in delivering results for continuous improvement	Yes	
	No	
	Opt out	

**Statement G**

**Choose one below**

The organisation policy of encouraging learning has made me to start studying for a new course to increase knowledge of my work	Yes	
	No	
	Opt out	

**4.4.3 Data Analysis Process**

The data collected through quantitative methodology was analysed in two ways. Firstly, descriptive statistics was used to present results in tables, charts and cross tabulations in order to analyse trends. T This was done using SSPS software. The second analysis was done using

partial structural equation modelling. The researcher employed structural equation modelling (SEM) to analyse the associations amongst variables being evaluated. SEM refers to a second generation multivariate evaluation technique that offers analysts a comprehensive technique to analyse and quantify theories.<sup>278</sup> This technique was adopted as it is suitable for research where the sample size is small and correct model specification cannot be ensured. Although it creates a lot of mean square errors in estimating the path coefficient loading and there can be an issue of multicollinearity, it is still useful for this type of research due to limited participants and data distribution being skewed. They are two sub-models in a structural equation model namely, the inner model and the outer model. The inner model (also called the structural model) consists of relationships between the independent and dependent latent variables. For this research, these are variables were learning organisation culture (independent latent variable) and information systems quality (dependent latent variable). The outer model (also called measurement model) is made up of the latent variable and observable indicators. An example of is the information system quality being a latent variable, and having observable indicators such as information quality, system quality and service quality. Below is the research model with the variables.

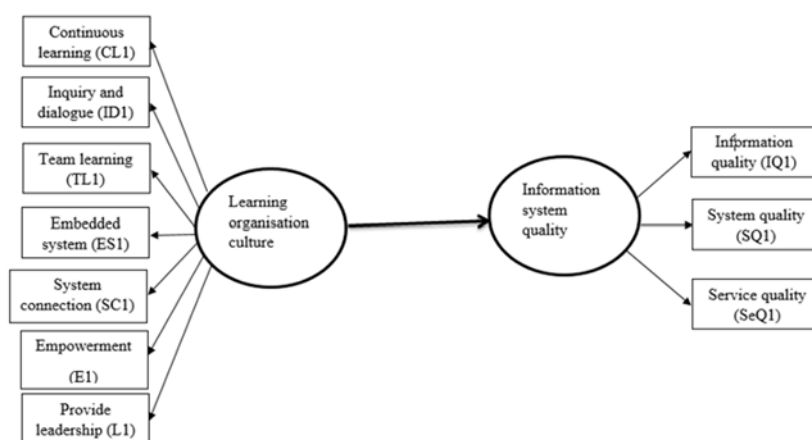


Figure 4.1 Research model with variables

The researcher analysed both endogenous variables (fundamental dependent variables) and exogenous variables (extrinsic forecasters).

The approach to partial least square SEM used in this research was done using the SmartPLS program. The results are presented in Chapter 5

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278 Jöreskog, K. G., Sörbom, Dag., SPSS INC., 1996. *LISREL 8 user's reference guide*. Chicago, IL: Scientific Software International.



#### 4.4.4 Tests Used Reliability and Validity of Data

There are a number of procedures or indicators employed to ascertain the suitability of the research model being investigated with using SEM. This researcher made use of indicator and internal consistency reliability. Further, convergent and discriminate validity was used. The inferences from the data were evaluated against the set criteria for approximate suitability to ascertain the depth of the deductions made in contrast to the suggested research model being validated.

#### 4.4.5 Limitation of Quantitative Methodology.

Despite the many advantages offered by the quantitative methodology which is outlined above, the length of the questionnaire discouraged the end users.<sup>279</sup> It is quite difficult to obtain different and useful information using structured data collection instruments as used in quantitative methods especially concerning sensitive topics. Self-reported information collected by using questionnaires may be inaccurate or incomplete which can seriously affect research validity and reliability.<sup>280</sup> In addition, research methods used in quantitative methods have been found to be quite inflexible since the instruments used in the approach cannot be modified after a research begins. Errors associated with hypotheses tested in quantitative research may yield misimpressions of program quality or influential factors. The process of reducing data to numbers as is the case in quantitative research may lead to loss of information. Errors in the selection of procedures for determining statistical significance can result in erroneous findings regarding impact. The follow up interviews were used to counter some of these disadvantages.

### 4.5 Ethical Considerations

The principles of the Belmont report regarding privacy and confidentiality were upheld during the entire research process. The autonomy of all respondents was considered and they were treated with respect and courtesy and allowance was made for informed consent to the study.<sup>281</sup> Permission was obtained before getting the informed consent of the respondents. The purpose of the study was also explained to the legal manager of Lumwana Mining Company and to the respondents in order to enable them to understand the full extent of the study. Data was collected anonymously in order to maintain a high level of confidentiality as

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279 Creswell, J. 2009. *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, C.A.: Sage

280 Cooper, D.R. and Schindler, P.S. 2006. *Business Research Method*. Boston: McGraw-Hill Irwin.

281 Cozby, P. 2009. *Methods in behavioral research*. Boston: McGraw Hill Higher Education

well as to reduce the degree of risk associated with disclosure of personal information about the respondents. In addition, the respondents were informed of their right to opt out from answering questions or to completely withdraw from the process without explanation or consequences should they feel like doing so at any stage of the research. The research participants were not members of a protected group (no minors, animals, prisoners, physically or mentally impaired subjects). It was agreed that interview transcripts would be stored in a personal computer (PC) for three years from the publication of the research. The data would then be permanently deleted from the PC to avoid chances of such data ending up in the hands of a third party.

#### **4.6 Conclusion**

This chapter on methodology has described the process followed to address the research aim and objectives of the study. The description of the quantitative and qualitative steps was complete and detailed to enable replication of the study. The steps for data analysis have been explained as well. The findings and analysis of the results are presented in Chapter 5.

## Chapter 5

# Data Analysis and Findings

### 5.1 Introduction

The data analysis results and findings of this research are presented in this chapter. The section deals with survey distribution, demographics, and descriptive statistics on individual variables of a learning organisation and information systems quality. Thereafter, a cross tabulation between demographic variables and each learning organisation dimension is presented. These results are presented in tables, charts and numbers. Next is the discussion on the reliability and validity of the research model and testing of the secondary and main hypotheses by using partial least squares structural equation modelling.

### 5.2 Survey Distribution

The survey was conducted by means of a questionnaire which was distributed to a sample of 100 respondents. Table 5.1 below shows the summary of responses achieved.

**Table 5.1: Survey responses**

<i>Questionnaires</i>	<i>Number</i>	<i>Percentage</i>
Returned	55	55%
Not Returned	45	45%
Sent Out	100	100%

Table 5.1 indicates that a total of 100 questionnaires were given out, of which 55 were returned. This is a response rate of 55 percent.

#### 5.2.1 Demographics

The question item, section 1 number 2 in the questionnaire asked the respondents about their gender. The profile of the results indicated that 85.45 percent of the respondents were male

whereas 14.55 percent of the respondents were female. The explanation for this difference in response would be that, the mining environment is male dominated. Traditionally in Lumwana society, females are required to look after the household and they have less involvement in male dominated careers. Table 5.2 below shows the survey responses by gender.

**Table 5.2: Survey response by gender**

<i>Gender</i>	<i>Sample</i>		<i>Population</i>	
	<i>Number</i>	<i>Percentage</i>	<i>Number</i>	<i>Percentage</i>
Male	47	85.45%	1001	88.51%
Female	8	14.55%	130	11.49%
<b>Total</b>	55	100%	1131	100%

The question item, section 1 number 3 in the questionnaire asked the respondents about their employment category. 25.45 percent of the respondents were senior staff. Further, 74.55 percent of the respondents were junior staff. There was no management respondent in the survey. This is because the target population was made up of employees recruited from the local community whose level of education and experience had not yet met the requirements to join management levels. Table 5.3 below is the survey response by staff category.

**Table 5.3: Survey responses by staff category**

<i>Staff Category</i>	<i>Sample</i>		<i>Population</i>	
	<i>Number</i>	<i>Percentage</i>	<i>Number</i>	<i>Percentage</i>
Senior Staff	14	25.45%	313	27.67%
Junior Staff	41	74.55%	818	72.33%
Management Staff	0	0.00%	0	0.00%
<b>Total</b>	55	100.00%	1131	100.00%

The question item, section 1 number 4 in the questionnaire asked the respondents about their highest qualification. The majority of the respondents had grade 12 certificate as their highest qualification, representing 43.64 percent. The respondents who had a college certificate were 27.27 percent while 23.64 percent had a college diploma and 5.45 percent had a degree. Table 5.4 below shows the survey results by highest qualification.

**Table 5.4: Survey results by highest**

<i>Qualification</i>	<i>Number</i>	<i>Percentage</i>
Grade 12 Certificate	24	43.64%
College Certificate	15	27.27%
College Diploma	13	23.64%
University Degree	3	5.45%
University Masters	0	0.00
University PhD	0	0.00
<b>Total</b>	55	100.00%

In response to question item, section 1 number 6 in the questionnaire, the respondents indicated the total number of years they had worked at Lumwana mine. Eighty percent of the respondents had been with the organisation for more than five (5) years, whereas 20 percent had only worked between 1 to 5 years. No one among the respondents had experience working at the mine less than one year. The results showed stability in the workforce recruited from the local community. This would have been as a result of the need to be closer to their family members in the nearby villages. Lumwana society regards extend family system as an important tradition. The other reason would have been the conditions of service at Lumwana mine which were very good resulting in employee retention. Table 5.5 below shows the key findings of the survey on years of experience working at Lumwana mine.

**Table 5.5: Survey results by experience working at mine**

<i>Experience(years)</i>	<i>Number</i>	<i>Percentage</i>
< 1 year	0	0.00%
1-5 years	11	20.00%
> 5 years	44	80.00%
<b>Total</b>	55	100.00%

The question item, section 1 number 1 in the questionnaire asked the respondents about the information system they used frequently. The majority of the respondents used Jigsaw system and this represented 20 percent of the total respondents. 18.18 percent used Intranet system whereas 10.91 percent frequently used Modular fleet management system. PC 7 control room management system, Oracle ERP, Mincare and File Systems were used by 9.09 percent of the respondents. Pronto was used by 7.27 percent whereas Graphical console was used by 5.5 percent. Inflight system was used by 1.82 percent of the respondents. Below is Table 5.6

showing the key findings of the survey results by information system frequently used.

**Table 5.6: Survey results by information system frequently used**

<i>System</i>	<i>Number</i>	<i>Percentage of total respondents</i>
Modular	6	10.91%
Intranet	10	18.18%
Oracle	5	9.09%
Pronto	4	7.27%
Graphic Console	3	5.45%
PC 7	5	9.09%
Jigsaw	11	20.00%
Inflight	1	1.82%
File Server	5	9.09%
MinCare	5	9.09%
<b>Total</b>	<b>55</b>	<b>100.00%</b>

In response to question item, section 1 number 5 in the questionnaire, the majority of the respondents belonged to Process department and represented 21.82 percent of the total respondents. 18.18 percent belonged to Mining whereas 18.18 percent belonged to Commercial Services. 16.36 percent belonged to Security and 10.91 percent belonged to Technical Services. Environment was represented by 1.82 percent whereas Sustainability was 7.27 percent and Human Resources was 5.45 percent. The majority of the workforce is in operational departments which are Mining and Process. Below is Table 5.7 showing the key findings of the survey results by department.

**Table 5.7: Survey results by department**

<i>Department</i>	<i>Number</i>	<i>Percentage</i>
Mining	10	18.18 %
Process	12	21.82 %
Commercial Services	10	18.18 %
Technical Services	6	10.91 %
Security	9	16.36 %
Environment	1	1.82 %
Sustainability	4	7.27 %
Human Resources	3	5.45 %
<b>Total</b>	<b>55</b>	<b>100.00 %</b>

### 5.2.2 Learning Organisation Culture Key Results and Findings

This section presents views of respondents with regard to statements about learning

organisation culture (or organisation learning culture) which are contained in section 2 of the questionnaire. The presentation of findings is made in two parts. Firstly, the general response to the learning organisation culture variable and then secondly, the cross tabulation with demographic variables.

#### a) Continuous learning

This section shows general response to section 2 statement 1 where respondents were asked whether they continue to learn about the information system as they use it. The question was in the category of continuous learning dimension. Next is the detailed presentation of findings which cross tabulated demographic variables and continuous learning.

Table 5.8 below shows the case processing summary. One respondent opted out of answering this question. For this reason there was 98.2 percent response rate specifically to this question.

**Table 5.8: Continuous learning case processing summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Qualification * Continuous Learning	55	98.2%	1	1.8%	56	100.0%
Information System * Continuous Learning	55	98.2%	1	1.8%	56	100.0%
Gender * Continuous Learning	55	98.2%	1	1.8%	56	100.0%
Years of Experience * Continuous Learning	55	98.2%	1	1.8%	56	100.0%
Staff Category * Continuous Learning	55	98.2%	1	1.8%	56	100.0%
Department * Continuous Learning	55	98.2%	1	1.8%	56	100.0%

Table 5.9 below shows the cross tabulation between gender and continuous learning. 52.2 percent of the males agreed with the statement that continuous learning takes place whilst 55.6% of females strongly agreed with the statement. The percentage of the females that strongly agreed was higher compared to males. Although the company provides equal opportunities, the Lumwana society traditional belief system has always regarded a female's

role as one that is home based. Therefore, most females have to learn a lot more in order to prove themselves and compete favorably with males.

**Table 5.9: Gender\* Continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Gender	Male	Count	1	2	24	18	1	46
		% within Gender	2.2%	4.3%	52.2%	39.1%	2.2%	100.0%
	Female	Count	0	1	2	5	1	9
		% within Gender	0.0%	11.1%	22.2%	55.6%	11.1%	100.0%
Total		Count	1	3	26	23	2	55
		% within Gender	1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

Table 5.10 below shows that 52.5 percent of junior staff agreed with the statement whereas 53.3 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 47.3 percent.

**Table 5.10: Staff category \* Continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Staff Category	Junior Staff	Count	1	2	21	15	1	40
		% within Staff Category	2.5%	5.0%	52.5%	37.5%	2.5%	100.0%
	Senior Staff	Count	0	1	5	8	1	15
		% within Staff Category	0.0%	6.7%	33.3%	53.3%	6.7%	100.0%
Total		Count	1	3	26	23	2	55
		% within Staff Category	1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

Table 5.11 below shows that on average respondents from all the departments agreed with the statement with average 47.3 percent. The highest was in Process, with 83.3 percent followed



by Mining with 70 percent. These specific departments have a dedicated training section each and do conduct a number of trainings for their departments.

**Table 5.11: Department\* Continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Department Mining	Count		0	0	7	3	0	10
	% within Department		0.0%	0.0%	70.0%	30.0%	0.0%	100.0%
Processing	Count		0	0	10	2	0	12
	% within Department		0.0%	0.0%	83.3%	16.7%	0.0%	100.0%
Commercial Services	Count		0	0	4	5	1	10
	% within Department		0.0%	0.0%	40.0%	50.0%	10.0%	100.0%
Technical Services	Count		1	1	1	3	0	6
	% within Department		16.7%	16.7%	16.7%	50.0%	0.0%	100.0%
Security	Count		0	1	2	5	0	8
	% within Department		0.0%	12.5%	25.0%	62.5%	0.0%	100.0%
Environment	Count		0	0	0	1	0	1
	% within Department		0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Sustainability	Count		0	0	1	2	1	4
	% within Department		0.0%	0.0%	25.0%	50.0%	25.0%	100.0%
Human Resources	Count		0	1	1	2	0	4
	% within Department		0.0%	25.0%	25.0%	50.0%	0.0%	100.0%
Total	Count		1	3	26	23	2	55
	% within Department		1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

Table 5.12 shows that among respondents with high school certificate, 66.7 percent agreed with the statement whereas 64.3 percent of respondents with a college certificate agreed. 42.9 percent of respondents with a college diploma agreed and 66.7 percent of respondents with a

university undergraduate degree agreed. On average 47.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.12: Highest qualification\* Continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Qualification	High School Certificate	Count	1	1	16	6	0	24
		% within Qualification	4.2%	4.2%	66.7%	25.0%	0.0%	100.0%
	College Certificate	Count	0	1	3	9	1	14
		% within Qualification	0.0%	7.1%	21.4%	64.3%	7.1%	100.0%
	College Diploma	Count	0	1	6	6	1	14
		% within Qualification	0.0%	7.1%	42.9%	42.9%	7.1%	100.0%
	University Undergraduate Degree	Count	0	0	1	2	0	3
		% within Qualification	0.0%	0.0%	33.3%	66.7%	0.0%	100.0%
Total		Count	1	3	26	23	2	55
		% within Qualification	1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

Table 5.13 shows that 60 percent of respondents with 1-5 years working experience at the mine strongly agreed with the statement whereas 51.1 percent of those with more than five years' experience agreed. On average 47.3 percent of respondents from both groups agreed with the statement.

**Table 5.13: Years of experience\* continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Years of Experience	1-5 years	Count	0	1	3	6	0	10
		% within Years of Experience	0.0%	10.0%	30.0%	60.0%	0.0%	100.0%
	> 5 years	Count	1	2	23	17	2	45
		% within Years of Experience	2.2%	4.4%	51.1%	37.8%	4.4%	100.0%

Total	Count	1	3	26	23	2	55
	% within Years of Experience	1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

Table 5.14 shows that 47.7 percent of the respondents using various systems on average agreed with the statement. Respondents who used Inflight, Jigsaw and Mincare had 100 percent agreement. This can be explained by the fact that users of these systems are few and there is adequate individual training support from the vendor.

**Table 5.14: Information system\* continuous learning**

			Continuous Learning					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Information System	Modular	Count	1	1	2	2	0	6
		% within Information System	16.7%	16.7%	33.3%	33.3%	0.0%	100.0%
Intranet		Count	0	2	10	5	1	18
		% within Information System	0.0%	11.1%	55.6%	27.8%	5.6%	100.0%
Oracle		Count	0	0	5	5	1	11
		% within Information System	0.0%	0.0%	45.5%	45.5%	9.1%	100.0%
Pronto		Count	0	0	2	2	0	4
		% within Information System	0.0%	0.0%	50.0%	50.0%	0.0%	100.0%
Graphical Console		Count	0	0	1	2	0	3
		% within Information System	0.0%	0.0%	33.3%	66.7%	0.0%	100.0%
MS File		Count	0	0	1	4	0	5
		% within Information System	0.0%	0.0%	20.0%	80.0%	0.0%	100.0%

Server	% within Information System	0.0%	0.0%	20.0%	80.0%	0.0%	100.0%
Inflight	Count	0	0	0	1	0	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Email System	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Process Control 7	Count	0	0	3	0	0	3
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
MS Office System	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Jigsaw	Count	0	0	0	1	0	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
MinCare	Count	0	0	0	1	0	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	1	3	26	23	2	55
	% within Information System	1.8%	5.5%	47.3%	41.8%	3.6%	100.0%

### b) Inquiry and dialogue

This section shows general response to section 2 statement 2 where respondents were asked whether they are given open and honest feedback by friends about the system they use. The question was in the category of inquiry and dialogue dimension. Next is the detailed presentation of findings which cross tabulated demographic variables and inquiry and dialogue.

Table 5.15 below shows the case processing summary. Three respondents opted out of answering this question. For this reason there was 94.6 percent response rate specifically to this question.

**Table 5.15: Inquiry and dialogue Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Qualification * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%
Information System * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%
Gender * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%
Years of Experience * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%
Staff Category * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%
Department * Inquiry and dialogue	53	94.6%	3	5.4%	56	100.0%

Table 5.16 below shows the cross tabulation between gender and inquiry and dialogue. 66.7 percent of the males and 62.5 percent of the females agreed with the statement. On average, 66 percent agreed with the statement. Due to the advanced technologies that were being used for the first time, inquiry and dialogue was promoted and regarded as key to the learning processes.

**Table 5.16: Gender\* Inquiry and dialogue**

			Inquiry and dialogue				Total
			Disagree	Agree	Strongly agree	Opt Out	
Gender	Male	Count	4	30	10	1	45
		% within Gender	8.9%	66.7%	22.2%	2.2%	100.0%
	Female	Count	1	5	2	0	8
		% within Gender	12.5%	62.5%	25.0%	0.0%	100.0%
Total		Count	5	35	12	1	53
		% within Gender	9.4%	66.0%	22.6%	1.9%	100.0%

Table 5.17 below shows that 69.2 percent of junior staff agreed with the statement whereas 57.1 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 66 percent.

**Table 5.17: Staff category \* Inquiry and dialogue**

			Inquiry and dialogue				Total
			Disagree	Agree	Strongly agree	Opt Out	
Staff Category	Junior Staff	Count	4	27	8	0	39
		% within Staff Category	10.3%	69.2%	20.5%	0.0%	100.0%
Senior Staff	Count	1	8	4	1	14	
		% within Staff Category	7.1%	57.1%	28.6%	7.1%	100.0%
Total	Count	5	35	12	1	53	
		% within Staff Category	9.4%	66.0%	22.6%	1.9%	100.0%

Table 5.18 below shows that on average respondents from all the departments agreed with the statement with average 66 percent. The highest was in Mining, with 100 percent followed by Commercial Services with 70 percent, Process and Sustainability with 66.7 percent each.

**Table 5.18: Department\* Inquiry and dialogue**

			Inquiry and dialogue				Total
			Disagree	Agree	Strongly agree	Opt Out	
Department Mining	Count	0	10	0	0	10	
		% within Department	0.0%	100.0%	0.0%	0.0%	100.0%
Processing	Count	0	8	4	0	12	
		% within Department	0.0%	66.7%	33.3%	0.0%	100.0%
Commercial Services	Count	1	7	1	1	10	
		% within Department	10.0%	70.0%	10.0%	10.0%	100.0%
Technical Services	Count	2	2	2	0	6	

	% within Department	33.3%	33.3%	33.3%	0.0%	100.0%
Security	Count	1	5	2	0	8
	% within Department	12.5%	62.5%	25.0%	0.0%	100.0%
Environment	Count	1	0	0	0	1
	% within Department	100.0%	0.0%	0.0%	0.0%	100.0%
Sustainability	Count	0	2	1	0	3
	% within Department	0.0%	66.7%	33.3%	0.0%	100.0%
Human Resources	Count	0	1	2	0	3
	% within Department	0.0%	33.3%	66.7%	0.0%	100.0%
Total	Count	5	35	12	1	53
	% within Department	9.4%	66.0%	22.6%	1.9%	100.0%

Table 5.19 shows that among respondents with high school certificate, 75 percent agreed with the statement whereas 53.8 percent of respondents with a college certificate agreed. 69.2 percent of respondents with a college diploma agreed and 66.7 percent of respondents with a university undergraduate degree strongly agreed. On average 66 percent across all respondents with various qualifications agreed with the statement.

**Table 5.19: Highest qualification\* Inquiry and dialogue**

			Inquiry and dialogue				
			Disagree	Agree	Strongly agree	Opt Out	Total
Qualification	High School Certificate	Count	2	18	4	0	24
		% within Qualification	8.3%	75.0%	16.7%	0.0%	100.0%
College Certificate		Count	3	7	3	0	13
		% within Qualification	23.1%	53.8%	23.1%	0.0%	100.0%
College Diploma		Count	0	9	3	1	13
		% within Qualification	0.0%	69.2%	23.1%	7.7%	100.0%
University		Count	0	1	2	0	3

	Undergraduate Degree	% within Qualification	0.0%	33.3%	66.7%	0.0%	100.0%
Total		Count	5	35	12	1	53
		% within Qualification	9.4%	66.0%	22.6%	1.9%	100.0%

Table 5.20 shows that 55.6 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 68.2 percent of those with more than five years' experience agreed. On average 66 percent of respondents from both groups agreed with the statement.

**Table 5.20: Years of experience\* Inquiry and dialogue**

			Inquiry and dialogue				
			Disagree	Agree	Strongly agree	Opt Out	Total
Years of Experience	1-5 years	Count	2	5	2	0	9
		% within Years of Experience	22.2%	55.6%	22.2%	0.0%	100.0%
	> 5 years	Count	3	30	10	1	44
		% within Years of Experience	6.8%	68.2%	22.7%	2.3%	100.0%
Total		Count	5	35	12	1	53
		% within Years of Experience	9.4%	66.0%	22.6%	1.9%	100.0%

Table 5.21 shows that 66 percent of the respondents using various systems on average agreed with the statement. Respondents who used email system, graphical console, Microsoft office and Mincare had 100 percent agreement.

**Table 5.21: Information system\* Inquiry and dialogue**

			Inquiry and dialogue				
			Disagree	Agree	Strongly agree	Opt Out	Total
Information System	Modular	Count	2	3	1	0	6
		% within Information System	33.3%	50.0%	16.7%	0.0%	100.0%
	Intranet	Count	1	13	3	0	17
		% within Information System	5.9%	76.5%	17.6%	0.0%	100.0%
	Oracle	Count	0	6	3	1	10



	% within Information System	0.0%	60.0%	30.0%	10.0%	100.0%
Pronto	Count	0	3	1	0	4
	% within Information System	0.0%	75.0%	25.0%	0.0%	100.0%
Graphical Console	Count	0	3	0	0	3
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
MS File Server	Count	1	2	2	0	5
	% within Information System	20.0%	40.0%	40.0%	0.0%	100.0%
Inflight	Count	1	0	0	0	1
	% within Information System	100.0%	0.0%	0.0%	0.0%	100.0%
Email System	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
Process Control 7	Count	0	2	1	0	3
	% within Information System	0.0%	66.7%	33.3%	0.0%	100.0%
MS Office System	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
Jigsaw	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
MinCare	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
Total	Count	5	35	12	1	53
	% within Information System	9.4%	66.0%	22.6%	1.9%	100.0%

### c) Collaboration and Team learning

This section shows general response to section 2 statement 3 where respondents were asked whether they ask their team members when they encounter difficulties and they are offered help. The response was in line with the collaboration and team leaning dimension. Next is the detailed presentation of findings which cross tabulated demographic variables and team

learning.

Table 5.22 below shows the case processing summary. One respondent opted out of answering this question. For this reason there was 98.2 percent response rate specifically to this question.

**Table 5.22: Team learning case processing summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Team learning	55	98.2%	1	1.8%	56	100.0%
Staff Category * Team learning	55	98.2%	1	1.8%	56	100.0%
Department * Team learning	55	98.2%	1	1.8%	56	100.0%
Qualification * Team learning	55	98.2%	1	1.8%	56	100.0%
Years of Experience * Team learning	55	98.2%	1	1.8%	56	100.0%
Information System * Team learning	55	98.2%	1	1.8%	56	100.0%

Table 5.23 below shows the cross tabulation between gender and team learning. 53.2 percent of the males agreed with the statement that team learning takes place whilst 62.5 percent of females strongly agreed with the statement. On average 50.9 percent agreed with the statement. Generally Lumwana society traditional belief system promotes togetherness in clans and villages. Therefore, individuals recruited from such environments are more likely to work together in teams and communicate effectively using their local language. This is positively influenced by the establishment of crews in operational departments.

**Table 5.23: Gender\* team learning**

			Team learning			Total
			Agree	Strongly agree	Opt out	
Gender	Male	Count	25	21	1	47
		% within Gender	53.2%	44.7%	2.1%	100.0%
	Female	Count	3	5	0	8
		% within Gender	37.5%	62.5%	0.0%	100.0%
Total		Count	28	26	1	55
		% within Gender	50.9%	47.3%	1.8%	100.0%

Table 5.24 below shows that 55 percent of junior staff agreed with the statement whereas 53.3 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 50.9 percent. The agreement would have been a result of the organisation value system which promotes team work.

**Table 5.24: Staff category \* team learning**

			Team learning			Total
			Agree	Strongly agree	Opt out	
Staff Category	Junior Staff	Count	22	18	0	40
		% within Staff Category	55.0%	45.0%	0.0%	100.0%
	Senior Staff	Count	6	8	1	15
		% within Staff Category	40.0%	53.3%	6.7%	100.0%
Total		Count	28	26	1	55
		% within Staff Category	50.9%	47.3%	1.8%	100.0%

Table 5.25 below shows that on average respondents from all the departments agreed with the statement with average 50.9 percent. The highest was in Security, with 66.7 percent followed by Mining with 60 percent. These specific departments had teams in form of crews and working groups.

**Table 5.25: Department\* team learning**

			Team learning			Total
			Agree	Strongly agree	Opt out	
Department	Mining	Count	6	4	0	10
		% within Department	60.0%	40.0%	0.0%	100.0%
	Processing	Count	7	5	0	12
		% within Department	58.3%	41.7%	0.0%	100.0%
	Commercial Services	Count	4	5	1	10
		% within Department	40.0%	50.0%	10.0%	100.0%
	Technical Services	Count	2	4	0	6
		% within Department	33.3%	66.7%	0.0%	100.0%

Security	Count	6	3	0	9
	% within Department	66.7%	33.3%	0.0%	100.0%
Environment	Count	0	1	0	1
	% within Department	0.0%	100.0%	0.0%	100.0%
Sustainability	Count	1	2	0	3
	% within Department	33.3%	66.7%	0.0%	100.0%
Human Resources	Count	2	2	0	4
	% within Department	50.0%	50.0%	0.0%	100.0%
Total	Count	28	26	1	55
	% within Department	50.9%	47.3%	1.8%	100.0%

Table 5.26 shows that among respondents with high school certificate, 62.5 percent agreed with the statement whereas 57.1 percent of respondents with a college certificate agreed. 57.1 percent of respondents with a college diploma strongly agreed and 100 percent of respondents with a university undergraduate degree agreed. On average 50.9 percent across all respondents with various qualifications agreed with the statement.

**Table 5.26: Highest qualification\* team learning**

Qualification		Team learning			Total
		Agree	Strongly agree	Opt out	
High School Certificate	Count	15	9	0	24
	% within Qualification	62.5%	37.5%	0.0%	100.0%
College Certificate	Count	8	6	0	14
	% within Qualification	57.1%	42.9%	0.0%	100.0%
College Diploma	Count	5	8	1	14
	% within Qualification	35.7%	57.1%	7.1%	100.0%
University Undergraduate Degree	Count	0	3	0	3
	% within Qualification	0.0%	100.0%	0.0%	100.0%
Total	Count	28	26	1	55

% within Qualification	50.9%	47.3%	1.8%	100.0%
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Table 5.27 shows that 72.7 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 52.3 percent of those with more than five years' experience agreed. On average 50.9 percent of respondents from both groups agreed with the statement.

**Table 5.27: Years of experience\* team learning**

			Team learning			Total
			Agree	Strongly agree	Opt out	
Years of Experience	1-5 years	Count	8	3	0	11
		% within Years of Experience	72.7%	27.3%	0.0%	100.0%
> 5 years	Count	20	23	1	44	
	% within Years of Experience	45.5%	52.3%	2.3%	100.0%	
Total	Count	28	26	1	55	
	% within Years of Experience	50.9%	47.3%	1.8%	100.0%	

Table 5.28 shows that 50.9 percent respondents using various systems on average agreed with the statement. Respondents who used Inflight, MS Office and Process control 7 had 100 percent agreement.

**Table 5.28: Information system\* team learning**

			Team learning			Total
			Agree	Strongly agree	Opt out	
Information System	Modular	Count	4	2	0	6
		% within Information System	66.7%	33.3%	0.0%	100.0%
Intranet	Count	8	10	0	18	
	% within Information System	44.4%	55.6%	0.0%	100.0%	
Oracle	Count	5	5	1	11	
	% within Information System	45.5%	45.5%	9.1%	100.0%	
Pronto	Count	2	2	0	4	

	% within Information System	50.0%	50.0%	0.0%	100.0%
Graphical Console	Count	2	1	0	3
	% within Information System	66.7%	33.3%	0.0%	100.0%
MS File Server	Count	2	3	0	5
	% within Information System	40.0%	60.0%	0.0%	100.0%
Inflight	Count	1	0	0	1
	% within Information System	100.0%	0.0%	0.0%	100.0%
Email System	Count	0	1	0	1
	% within Information System	0.0%	100.0%	0.0%	100.0%
Process Control 7	Count	3	0	0	3
	% within Information System	100.0%	0.0%	0.0%	100.0%
MS Office System	Count	1	0	0	1
	% within Information System	100.0%	0.0%	0.0%	100.0%
Jigsaw	Count	0	1	0	1
	% within Information System	0.0%	100.0%	0.0%	100.0%
MinCare	Count	0	1	0	1
	% within Information System	0.0%	100.0%	0.0%	100.0%
Total	Count	28	26	1	55
	% within Information System	50.9%	47.3%	1.8%	100.0%

#### d) Embedded System

This section shows general response to section 2 statement 4 where respondents were asked whether when they recommend improvements, the organisation acts on them. The response was in line with the embedded system dimension which works towards establishment of systems to capture and share learning. Next is the detailed presentation of findings which cross tabulated demographic variables and embedded system.

Table 5.29 below shows the case processing summary. Four respondents opted out of answering this question. For this reason there was 92.9 percent response rate specifically to this question.

**Table 5.29: Embedded system case processing summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Embedded System	52	92.9%	4	7.1%	56	100.0%
Staff Category * Embedded System	52	92.9%	4	7.1%	56	100.0%
Department * Embedded System	52	92.9%	4	7.1%	56	100.0%
Qualification * Embedded System	52	92.9%	4	7.1%	56	100.0%
Years of Experience * Embedded System	52	92.9%	4	7.1%	56	100.0%
Information System * Embedded System	52	92.9%	4	7.1%	56	100.0%

Table 5.30 below shows the cross tabulation between gender and embedded system. 59.1 percent of the males and 50 percent of the females agreed with the statement that when they make recommendations, the organisation acts on them. They are various systems and processes the employees learnt and used which was part of the organisation value system and resulted in a continuous improvement effort.

**Table 5.30: Gender\* embedded system**

	Embedded System						Total
	Strongly disagree	Disagree	Agree	Strongly agree	Opt out		
Gender Male	Count	3	11	26	3	1	44
	% within Gender	6.8%	25.0%	59.1%	6.8%	2.3%	100.0%
Gender Female	Count	1	3	4	0	0	8
	% within Gender	12.5%	37.5%	50.0%	0.0%	0.0%	100.0%
Total	Count	4	14	30	3	1	52
	% within Gender	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%

Table 5.31 below shows that 55.3 percent of junior staff agreed with the statement whereas 64.3 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 57.7 percent.

**Table 5.31: Staff category \* embedded system**

			Embedded System					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Staff Category	Junior Staff	Count	3	10	21	3	1	38
		% within Staff Category	7.9%	26.3%	55.3%	7.9%	2.6%	100.0%
Senior Staff	Count	1	4	9	0	0	14	
	% within Staff Category	7.1%	28.6%	64.3%	0.0%	0.0%	100.0%	
Total	Count	4	14	30	3	1	52	
	% within Staff Category	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%	

Table 5.32 below shows that on average respondents from all the departments agreed with the statement with average 57.7 percent. The highest was in Sustainability, with 100 percent followed by Process with 66.7 percent.

**Table 5.32: Department\* embedded system**

			Embedded System					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Department Mining	Count	1	4	4	0	0	9	
	% within Department	11.1%	44.4%	44.4%	0.0%	0.0%	100.0%	
Processing	Count	0	3	8	0	1	12	
	% within Department	0.0%	25.0%	66.7%	0.0%	8.3%	100.0%	
Commercial Services	Count	1	4	5	0	0	10	
	% within Department	10.0%	40.0%	50.0%	0.0%	0.0%	100.0%	
Technical Services	Count	0	1	4	1	0	6	
	% within Department	0.0%	16.7%	66.7%	16.7%	0.0%	100.0%	



Security	Count	1	2	4	1	0	8
	% within Department	12.5%	25.0%	50.0%	12.5%	0.0%	100.0%
Environment	Count	0	0	0	1	0	1
	% within Department	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Sustainability	Count	0	0	3	0	0	3
	% within Department	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Human Resources	Count	1	0	2	0	0	3
	% within Department	33.3%	0.0%	66.7%	0.0%	0.0%	100.0%
Total	Count	4	14	30	3	1	52
	% within Department	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%

Table 5.33 shows that among respondents with high school certificate, 56.5 percent agreed with the statement whereas 53.8 percent of respondents with a college certificate agreed. 53.8 percent of respondents with a college diploma agreed and 100 percent of respondents with a university undergraduate degree agreed. On average 57.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.33: Highest qualification\* embedded system**

			Embedded System					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Qualification	High School Certificate	Count	1	7	13	1	1	23
		% within Qualification	4.3%	30.4%	56.5%	4.3%	4.3%	100.0%
	College Certificate	Count	1	3	7	2	0	13
		% within Qualification	7.7%	23.1%	53.8%	15.4%	0.0%	100.0%
	College Diploma	Count	2	4	7	0	0	13
		% within Qualification	15.4%	30.8%	53.8%	0.0%	0.0%	100.0%
	University Undergraduate Degree	Count	0	0	3	0	0	3
		% within Qualification	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%

Total	Count	4	14	30	3	1	52
	% within	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%
	Qualification						

Table 5.34 shows that 55.6 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 58.1 percent of those with more than five years' experience agreed. On average 57.7 percent of respondents from both groups agreed with the statement.

**Table 5.34: Years of experience\* continuous learning**

			Embedded System					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Years of Experience	1-5 years	Count	1	2	5	1	0	9
		% within Years of Experience	11.1%	22.2%	55.6%	11.1%	0.0%	100.0%
	> 5 years	Count	3	12	25	2	1	43
		% within Years of Experience	7.0%	27.9%	58.1%	4.7%	2.3%	100.0%
Total		Count	4	14	30	3	1	52
		% within Years of Experience	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%

Table 5.35 shows that 57.7 percent respondents using various systems on average agreed with the statement. Respondents who used Inflight, Jigsaw, email and Mincare had 100 percent agreement.

**Table 5.35: Information system\* embedded system**

			Embedded System					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Information System	Modular	Count	0	2	3	1	0	6
		% within Information System	0.0%	33.3%	50.0%	16.7%	0.0%	100.0%
	Intranet	Count	1	4	12	0	0	17
		% within Information System	5.9%	23.5%	70.6%	0.0%	0.0%	100.0%
	Oracle	Count	1	2	6	0	0	9

	% within Information System	11.1%	22.2%	66.7%	0.0%	0.0%	100.0%
Pronto	Count	1	1	2	0	0	4
	% within Information System	25.0%	25.0%	50.0%	0.0%	0.0%	100.0%
Graphical Console	Count	0	2	1	0	0	3
	% within Information System	0.0%	66.7%	33.3%	0.0%	0.0%	100.0%
MS File Server	Count	1	1	1	2	0	5
	% within Information System	20.0%	20.0%	20.0%	40.0%	0.0%	100.0%
Inflight	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Email System	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Process Control 7	Count	0	2	1	0	0	3
	% within Information System	0.0%	66.7%	33.3%	0.0%	0.0%	100.0%
MS Office System	Count	0	0	0	0	1	1
	% within Information System	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Jigsaw	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
MinCare	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
<b>Total</b>	Count	4	14	30	3	1	52

% within Information System	7.7%	26.9%	57.7%	5.8%	1.9%	100.0%
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**e) System connection**

This section shows general response to section 2 statement 5 where respondents were asked whether they are rewarded for being a good performer and taking initiative. The response was in line with the system connection dimension which works towards connecting the organisation to its community and environment. Next is the detailed presentation of findings which cross tabulated demographic variables and system connection.

Table 5.36 below shows the case processing summary. Three respondents opted out of answering this question. For this reason there was 94.6 percent response rate specifically to this question.

**Table 5.36: System connection case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * System Connection	53	94.6%	3	5.4%	56	100.0%
Staff Category * System Connection	53	94.6%	3	5.4%	56	100.0%
Department * System Connection	53	94.6%	3	5.4%	56	100.0%
Qualification * System Connection	53	94.6%	3	5.4%	56	100.0%
Years of Experience * System Connection	53	94.6%	3	5.4%	56	100.0%
Information System * System Connection	53	94.6%	3	5.4%	56	100.0%

Table 5.37 below shows the cross tabulation between gender and system connection. 40 percent of the males agreed with the statement whilst 50 percent of females disagreed with the statement.

**Table 5.37: Gender\* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Gender	Male	Count	6	14	18	6	1	45
		% within Gender	13.3%	31.1%	40.0%	13.3%	2.2%	100.0%
	Female	Count	1	4	2	1	0	8
		% within Gender	12.5%	50.0%	25.0%	12.5%	0.0%	100.0%
Total		Count	7	18	20	7	1	53
		% within Gender	13.2%	34.0%	37.7%	13.2%	1.9%	100.0%

Table 5.38 below shows that 41 percent of junior staff agreed with the statement whereas 42.9 percent of the senior staff disagreed. On average, both junior staff and senior staff agreed to the statement at 37.7 percent.

**Table 5.38: Staff category \* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Staff Category	Junior Staff	Count	6	12	16	5	0	39
		% within Staff Category	15.4%	30.8%	41.0%	12.8%	0.0%	100.0%
	Senior Staff	Count	1	6	4	2	1	14
		% within Staff Category	7.1%	42.9%	28.6%	14.3%	7.1%	100.0%
Total		Count	7	18	20	7	1	53
		% within Staff Category	13.2%	34.0%	37.7%	13.2%	1.9%	100.0%

Table 5.39 below shows that on average respondents from all the departments agreed with the statement with average 37.7 percent. The highest was in Environment and Technical services departments with 100 percent.

**Table 5.39: Department\* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Department Mining	Count		1	5	2	2	0	10
	% within Department		10.0%	50.0%	20.0%	20.0%	0.0%	100.0%
Processing	Count		3	5	3	1	0	12
	% within Department		25.0%	41.7%	25.0%	8.3%	0.0%	100.0%
Commercial Services	Count		1	4	4	1	0	10
	% within Department		10.0%	40.0%	40.0%	10.0%	0.0%	100.0%
Technical Services	Count		0	0	6	0	0	6
	% within Department		0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Security	Count		2	1	3	2	0	8
	% within Department		25.0%	12.5%	37.5%	25.0%	0.0%	100.0%
Environment	Count		0	0	1	0	0	1
	% within Department		0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Sustainability	Count		0	1	1	0	1	3
	% within Department		0.0%	33.3%	33.3%	0.0%	33.3%	100.0%
Human Resources	Count		0	2	0	1	0	3
	% within Department		0.0%	66.7%	0.0%	33.3%	0.0%	100.0%
Total	Count		7	18	20	7	1	53
	% within Department		13.2%	34.0%	37.7%	13.2%	1.9%	100.0%

Table 5.40 shows that among respondents with high school certificate, 45.8 percent agreed with the statement whereas 38.5 percent of respondents with a college certificate agreed. 30.8 percent of respondents with a college diploma agreed and 66.7 percent of respondents with a

university undergraduate degree disagreed. On average 37.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.40: Highest qualification\* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Qualification	High School Certificate	Count	3	9	11	1	0	24
		% within Qualification	12.5%	37.5%	45.8%	4.2%	0.0%	100.0%
	College Certificate	Count	2	3	5	3	0	13
		% within Qualification	15.4%	23.1%	38.5%	23.1%	0.0%	100.0%
	College Diploma	Count	2	4	4	3	0	13
		% within Qualification	15.4%	30.8%	30.8%	23.1%	0.0%	100.0%
	University Undergraduate Degree	Count	0	2	0	0	1	3
		% within Qualification	0.0%	66.7%	0.0%	0.0%	33.3%	100.0%
Total		Count	7	18	20	7	1	53
		% within Qualification	13.2%	34.0%	37.7%	13.2%	1.9%	100.0%

Table 5.41 shows that 33.3 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 38.6 percent of those with more than five years' experience agreed. On average 37.7 percent of respondents from both groups agreed with the statement.

**Table 5.41: Years of experience\* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Years of Experience	1-5 years	Count	2	2	3	2	0	9
		% within Years of Experience	22.2%	22.2%	33.3%	22.2%	0.0%	100.0%
	> 5 years	Count	5	16	17	5	1	44
		% within Years of Experience	11.4%	36.4%	38.6%	11.4%	2.3%	100.0%
Total		Count	7	18	20	7	1	53

% within Years of Experience	13.2%	34.0%	37.7%	13.2%	1.9%	100.0%
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Table 5.42 shows that 37.7 percent respondents using various systems on average agreed with the statement. Respondents who used Jigsaw and Mincare had 100 percent agreement.

**Table 5.42: Information system\* system connection**

			System Connection					Total
			Strongly disagree	Disagree	Agree	Strongly agree	Opt out	
Information System	Modular	Count	0	1	5	0	0	6
		% within Information System	0.0%	16.7%	83.3%	0.0%	0.0%	100.0%
	Intranet	Count	3	6	5	2	1	17
		% within Information System	17.6%	35.3%	29.4%	11.8%	5.9%	100.0%
	Oracle	Count	1	5	2	2	0	10
		% within Information System	10.0%	50.0%	20.0%	20.0%	0.0%	100.0%
	Pronto	Count	1	0	3	0	0	4
		% within Information System	25.0%	0.0%	75.0%	0.0%	0.0%	100.0%
	Graphical Console	Count	1	2	0	0	0	3
% within Information System		33.3%	66.7%	0.0%	0.0%	0.0%	100.0%	
MS File Server	Count	1	0	2	2	0	5	
	% within Information System	20.0%	0.0%	40.0%	40.0%	0.0%	100.0%	
Inflight	Count	0	1	0	0	0	1	
	% within Information System	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%	
Email System	Count	0	0	0	1	0	1	
	% within Information System	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%	



	% within Information System	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Process Control 7	Count	0	2	1	0	0	3
	% within Information System	0.0%	66.7%	33.3%	0.0%	0.0%	100.0%
MS Office System	Count	0	1	0	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
Jigsaw	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
MinCare	Count	0	0	1	0	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%
Total	Count	7	18	20	7	1	53
	% within Information System	13.2%	34.0%	37.7%	13.2%	1.9%	100.0%

#### f) Empowerment

This section shows general response to section 2 statement 6 where respondents were asked whether they are encouraged to ask and see answers when they do not understand. The response was in line with the empowering people toward collective vision dimension. Next is the detailed presentation of findings which cross tabulated demographic variables and empowerment.

Table 5.43 below shows the case processing summary. Three respondents opted out of answering this question. For this reason there was 94.6 percent response rate specifically to this question.

**Table 5.43: Empowerment Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Empowerment	53	94.6%	3	5.4%	56	100.0%
Staff Category * Empowerment	53	94.6%	3	5.4%	56	100.0%
Department * Empowerment	53	94.6%	3	5.4%	56	100.0%
Qualification * Empowerment	53	94.6%	3	5.4%	56	100.0%
Years of Experience * Empowerment	53	94.6%	3	5.4%	56	100.0%
Information System * Empowerment	53	94.6%	3	5.4%	56	100.0%

Table 5.44 below shows the cross tabulation between gender and empowerment. 53.3 percent of the males and 50 percent of the females agreed with the statement representing 52.8 percent average agreement on the dimension across male and females. The approach to operations include sharing of a common vision in form of targets to all employees before beginning of the month, week and shift. This makes everyone accountable and focused on the goals of the organisation as a bonus is paid out when monthly targets are achieved.

**Table 5.44: Gender\* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Gender	Male	Count	0	4	24	17	45
		% within Gender	0.0%	8.9%	53.3%	37.8%	100.0%
	Female	Count	1	0	4	3	8
		% within Gender	12.5%	0.0%	50.0%	37.5%	100.0%
Total		Count	1	4	28	20	53
		% within Gender	1.9%	7.5%	52.8%	37.7%	100.0%

Table 5.45 below shows that 51.3 percent of junior staff agreed with the statement whereas 57.1 percent of the senior staff agreed. On average, both junior staff and senior staff agreed to the statement at 52.8 percent.

**Table 5.45: Staff category \* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Staff Category	Junior Staff	Count	0	4	20	15	39
		% within Staff Category	0.0%	10.3%	51.3%	38.5%	100.0%
Staff Category	Senior Staff	Count	1	0	8	5	14
		% within Staff Category	7.1%	0.0%	57.1%	35.7%	100.0%
Total		Count	1	4	28	20	53
		% within Staff Category	1.9%	7.5%	52.8%	37.7%	100.0%

Table 5.46 below shows that on average respondents from all the departments agreed with the statement with average 52.8 percent. The highest was in Environment with 100 percent followed by Sustainability with 66.7 percent.

**Table 5.46: Department\* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Department Mining		Count	0	2	4	4	10
		% within Department	0.0%	20.0%	40.0%	40.0%	100.0%
Processing		Count	1	1	7	3	12
		% within Department	8.3%	8.3%	58.3%	25.0%	100.0%
Commercial Services		Count	0	0	6	4	10
		% within Department	0.0%	0.0%	60.0%	40.0%	100.0%
Technical Services		Count	0	0	4	2	6
		% within Department	0.0%	0.0%	66.7%	33.3%	100.0%
Security		Count	0	1	4	3	8
		% within Department	0.0%	12.5%	50.0%	37.5%	100.0%
Environment		Count	0	0	0	1	1

	% within Department	0.0%	0.0%	0.0%	100.0%	100.0%
Sustainability	Count	0	0	1	2	3
	% within Department	0.0%	0.0%	33.3%	66.7%	100.0%
Human Resources	Count	0	0	2	1	3
	% within Department	0.0%	0.0%	66.7%	33.3%	100.0%
Total	Count	1	4	28	20	53
	% within Department	1.9%	7.5%	52.8%	37.7%	100.0%

Table 5.47 shows that among respondents with high school certificate, 54.2 percent agreed with the statement whereas 46.2 percent of respondents with a college certificate agreed and strongly agreed. 53.8 percent of respondents with a college diploma agreed and 66.7 percent of respondents with a university undergraduate degree agreed. On average 52.8 percent across all respondents with various qualifications agreed with the statement.

**Table 5.47: Highest qualification\* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Qualification	High School Certificate	Count	0	3	13	8	24
		% within Qualification	0.0%	12.5%	54.2%	33.3%	100.0%
	College Certificate	Count	0	1	6	6	13
		% within Qualification	0.0%	7.7%	46.2%	46.2%	100.0%
	College Diploma	Count	1	0	7	5	13
		% within Qualification	7.7%	0.0%	53.8%	38.5%	100.0%
	University Undergraduate Degree	Count	0	0	2	1	3
		% within Qualification	0.0%	0.0%	66.7%	33.3%	100.0%
Total		Count	1	4	28	20	53
		% within Qualification	1.9%	7.5%	52.8%	37.7%	100.0%

Table 5.48 shows that 55.6 percent of respondents with 1-5 years working experience at the mine strongly agreed with the statement whereas 52.3 percent of those with more than five years' experience agreed. On average 52.8 percent of respondents from both groups agreed with the statement.

**Table 5.48: Years of experience\* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Years of Experience	1-5 years	Count	0	1	5	3	9
		% within Years of Experience	0.0%	11.1%	55.6%	33.3%	100.0%
	> 5 years	Count	1	3	23	17	44
		% within Years of Experience	2.3%	6.8%	52.3%	38.6%	100.0%
Total		Count	1	4	28	20	53
		% within Years of Experience	1.9%	7.5%	52.8%	37.7%	100.0%

Table 5.49 shows that 52.8 percent respondents using various systems on average agreed with the statement. Respondents who used Inflight, Jigsaw, email, MS Office and Mincare had 100 percent agreement. This can be explained by the fact that users of these systems are few and there is adequate training support from the vendor.

**Table 5.49: Information system\* empowerment**

			Empowerment				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Information System	Modular	Count	0	0	3	3	6
		% within Information System	0.0%	0.0%	50.0%	50.0%	100.0%
	Intranet	Count	0	3	8	6	17
		% within Information System	0.0%	17.6%	47.1%	35.3%	100.0%
	Oracle	Count	1	0	7	2	10
		% within Information System	10.0%	0.0%	70.0%	20.0%	100.0%
	Pronto	Count	0	0	2	2	4

	% within Information System	0.0%	0.0%	50.0%	50.0%	100.0%
Graphical Console	Count	0	1	0	2	3
	% within Information System	0.0%	33.3%	0.0%	66.7%	100.0%
MS File Server	Count	0	0	2	3	5
	% within Information System	0.0%	0.0%	40.0%	60.0%	100.0%
Inflight	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Email System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Process Control 7	Count	0	0	1	2	3
	% within Information System	0.0%	0.0%	33.3%	66.7%	100.0%
MS Office System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Jigsaw	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
MinCare	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	1	4	28	20	53
	% within Information System	1.9%	7.5%	52.8%	37.7%	100.0%

### g) Strategic leadership

This section shows general response to section 2 statement 7 where respondents were asked are encouraged by their supervisors to be a brother's keeper. The response was in line with the strategic leadership for learning dimension. Next is the detailed presentation of findings which cross tabulated demographic variables and strategic leadership.

Table 5.50 below shows the case processing summary. Two respondents opted out of answering this question. For this reason there was 96.4 percent response rate specifically to this question.

**Table 5.50: Strategic leadership case processing summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Leadership	54	96.4%	2	3.6%	56	100.0%
Staff Category * Leadership	54	96.4%	2	3.6%	56	100.0%
Department * Leadership	54	96.4%	2	3.6%	56	100.0%
Qualification * Leadership	54	96.4%	2	3.6%	56	100.0%
Years of Experience *	54	96.4%	2	3.6%	56	100.0%
Leadership	54	96.4%	2	3.6%	56	100.0%
Information System *	54	96.4%	2	3.6%	56	100.0%
Leadership	54	96.4%	2	3.6%	56	100.0%

Table 5.51 below shows the cross tabulation between gender and strategic leadership. 56.5 percent of the males and 62.5 percent of the females strongly agreed with the statement representing 57.4 percent average agreement on the dimension across male and females.

**Table 5.51: Gender\* strategic leadership**

			Leadership				Total
			Strongly disagree	Agree	Strongly agree	Opt out	
Gender	Male	Count	1	18	26	1	46
		% within Gender	2.2%	39.1%	56.5%	2.2%	100.0%
	Female	Count	0	3	5	0	8
		% within Gender	0.0%	37.5%	62.5%	0.0%	100.0%
Total		Count	1	21	31	1	54
		% within Gender	1.9%	38.9%	57.4%	1.9%	100.0%

Table 5.52 below shows that 59.0 percent of junior staff strongly agreed with the statement whereas 53.3 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 57.4 percent.

**Table 5.52: Staff category \* strategic leadership**

	Leadership	Total
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			Strongly disagree	Agree	Strongly agree	Opt out	
Staff Category	Junior Staff	Count	0	15	23	1	39
		% within Staff Category	0.0%	38.5%	59.0%	2.6%	100.0%
	Senior Staff	Count	1	6	8	0	15
		% within Staff Category	6.7%	40.0%	53.3%	0.0%	100.0%
Total		Count	1	21	31	1	54
		% within Staff Category	1.9%	38.9%	57.4%	1.9%	100.0%

Table 5.53 below shows that on average respondents from all the departments strongly agreed with the statement with average 57.3 percent. The highest was in Environment and Human resources with 100 percent.

**Table 5.53: Department\* strategic leadership**

			Leadership				Total
			Strongly disagree	Agree	Strongly agree	Opt out	
Department Mining		Count	0	7	3	0	10
		% within Department	0.0%	70.0%	30.0%	0.0%	100.0%
Processing		Count	0	7	5	0	12
		% within Department	0.0%	58.3%	41.7%	0.0%	100.0%
Commercial Services		Count	1	4	5	0	10
		% within Department	10.0%	40.0%	50.0%	0.0%	100.0%
Technical Services		Count	0	1	5	0	6
		% within Department	0.0%	16.7%	83.3%	0.0%	100.0%
Security		Count	0	1	6	1	8
		% within Department	0.0%	12.5%	75.0%	12.5%	100.0%
Environment		Count	0	0	1	0	1
		% within Department	0.0%	0.0%	100.0%	0.0%	100.0%
Sustainability		Count	0	0	3	0	3



	% within Department	0.0%	0.0%	100.0%	0.0%	100.0%
Human Resources	Count	0	1	3	0	4
	% within Department	0.0%	25.0%	75.0%	0.0%	100.0%
Total	Count	1	21	31	1	54
	% within Department	1.9%	38.9%	57.4%	1.9%	100.0%

Table 5.54 shows that among respondents with high school certificate, 54.2 percent agreed with the statement whereas 45.8 percent of respondents with a college certificate strongly agreed. 50 percent of respondents with a college diploma agreed and 100 percent of respondents with a university undergraduate degree agreed. On average 57.4 percent across all respondents with various qualifications agreed with the statement.

**Table 5.54: Highest qualification\* strategic leadership**

			Leadership				Total
			Strongly disagree	Agree	Strongly agree	Opt out	
Qualification	High School Certificate	Count	0	13	11	0	24
		% within Qualification	0.0%	54.2%	45.8%	0.0%	100.0%
	College Certificate	Count	0	2	10	1	13
		% within Qualification	0.0%	15.4%	76.9%	7.7%	100.0%
	College Diploma	Count	1	6	7	0	14
		% within Qualification	7.1%	42.9%	50.0%	0.0%	100.0%
	University Undergraduate Degree	Count	0	0	3	0	3
		% within Qualification	0.0%	0.0%	100.0%	0.0%	100.0%
Total		Count	1	21	31	1	54
		% within Qualification	1.9%	38.9%	57.4%	1.9%	100.0%

Table 5.55 shows that 60 percent of respondents with 1-5 years working experience at the mine strongly agreed with the statement whereas 56.8 percent of those with more than five

years' experience agreed. On average 57.4 percent of respondents from both groups agreed with the statement.

**Table 5.55: Years of experience\* strategic leadership**

			Leadership				Total
			Strongly disagree	Agree	Strongly agree	Opt out	
Years of Experience	1-5 years	Count % within Years of Experience	0 0.0%	3 30.0%	6 60.0%	1 10.0%	10 100.0%
	> 5 years	Count % within Years of Experience	1 2.3%	18 40.9%	25 56.8%	0 0.0%	44 100.0%
Total		Count % within Years of Experience	1 1.9%	21 38.9%	31 57.4%	1 1.9%	54 100.0%

Table 5.56 shows that 57.4 percent of the respondents using various systems on average agreed with the statement. Respondents who used MS Office and Mincare had 100 percent strong agreement.

**Table 5.56: Information system\* strategic leadership**

			Leadership				Total
			Strongly disagree	Agree	Strongly agree	Opt out	
Information System	Modular	Count % within Information System	0 0.0%	2 33.3%	4 66.7%	0 0.0%	6 100.0%
	Intranet	Count % within Information System	0 0.0%	6 35.3%	11 64.7%	0 0.0%	17 100.0%
	Oracle	Count % within Information System	1 9.1%	5 45.5%	5 45.5%	0 0.0%	11 100.0%
	Pronto	Count % within Information System	0 0.0%	3 75.0%	1 25.0%	0 0.0%	4 100.0%
	Graphical	Count	0	1	2	0	3

Console	% within Information System	0.0%	33.3%	66.7%	0.0%	100.0%
MS File Server	Count	0	0	4	1	5
	% within Information System	0.0%	0.0%	80.0%	20.0%	100.0%
Inflight	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
Email System	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
Process Control 7	Count	0	1	2	0	3
	% within Information System	0.0%	33.3%	66.7%	0.0%	100.0%
MS Office System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Jigsaw	Count	0	1	0	0	1
	% within Information System	0.0%	100.0%	0.0%	0.0%	100.0%
MinCare	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	1	21	31	1	54
	% within Information System	1.9%	38.9%	57.4%	1.9%	100.0%

### 5.2.3 Information Systems Quality Key Results and Findings

This section presents views of respondents with regard to statements about information system quality which are contained in section 3 of the questionnaire. The presentation of findings is made in two parts. Firstly, the general response to the information system quality variables and then secondly, the cross tabulation with demographic variables.

#### a) Information Quality

This section shows general response to section 3 statement 1 where respondents were asked whether system the frequently use produces readable information. Next is the detailed presentation of findings which cross tabulated empowerment with other demographic variables.

Table 5.57 below shows the case processing summary. One respondent opted out of answering this question. For this reason there was 98.2 percent response rate specifically to this question.

**Table 5.57: Information quality case processing summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Information Quality	55	98.2%	1	1.8%	56	100.0%
Staff Category * Information Quality	55	98.2%	1	1.8%	56	100.0%
Department * Information Quality	55	98.2%	1	1.8%	56	100.0%
Qualification * Information Quality	55	98.2%	1	1.8%	56	100.0%
Years of Experience * Information Quality	55	98.2%	1	1.8%	56	100.0%
Information System * Information Quality	55	98.2%	1	1.8%	56	100.0%

Table 5.58 below shows the cross tabulation between gender and information quality. 48.9 percent of the males agreed and 62.5 percent of the females strongly agreed with the statement representing 47.3 percent average agreement on information quality across male and females. The female’s strong agreement suggests strong attention to detail on the type of information they review.

**Table 5.58: Gender\* information quality**

			Information Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Gender	Male	Count	1	2	23	21	47
		% within Gender	2.1%	4.3%	48.9%	44.7%	100.0%
Female	Female	Count	0	0	3	5	8
		% within Gender	0.0%	0.0%	37.5%	62.5%	100.0%
Total	Total	Count	1	2	26	26	55
		% within Gender	1.8%	3.6%	47.3%	47.3%	100.0%

Table 5.59 below shows that 52.5 percent of junior staff agreed with the statement whereas 66.7 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 47.3 percent.

**Table 5.59: Staff category \* information quality**

			Information Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Staff Category	Junior Staff	Count	1	2	21	16	40
		% within Staff Category	2.5%	5.0%	52.5%	40.0%	100.0%
Staff Category	Senior Staff	Count	0	0	5	10	15
		% within Staff Category	0.0%	0.0%	33.3%	66.7%	100.0%
Total		Count	1	2	26	26	55
		% within Staff Category	1.8%	3.6%	47.3%	47.3%	100.0%

Table 5.60 below shows that on average respondents from all the departments agreed with the statement with average 47.3 percent. The highest was Environment, Sustainability with 100 percent followed up Commercial Services, with 80 percent followed by Mining with 70 percent.

**Table 5.60: Department\* information quality**

			Information Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Department Mining		Count	1	1	6	2	10
		% within Department	10.0%	10.0%	60.0%	20.0%	100.0%
Processing		Count	0	0	6	6	12
		% within Department	0.0%	0.0%	50.0%	50.0%	100.0%
Commercial Services		Count	0	0	2	8	10
		% within Department	0.0%	0.0%	20.0%	80.0%	100.0%
Technical Services		Count	0	0	3	3	6
		% within Department	0.0%	0.0%	50.0%	50.0%	100.0%
Security		Count	0	1	6	2	9
		% within Department	0.0%	11.1%	66.7%	22.2%	100.0%
Environment		Count	0	0	1	0	1
		% within Department	0.0%	0.0%	100.0%	0.0%	100.0%

Sustainability	Count	0	0	0	3	3
	% within Department	0.0%	0.0%	0.0%	100.0%	100.0%
Human Resources	Count	0	0	2	2	4
	% within Department	0.0%	0.0%	50.0%	50.0%	100.0%
Total	Count	1	2	26	26	55
	% within Department	1.8%	3.6%	47.3%	47.3%	100.0%

Table 5.61 shows that among respondents with high school certificate, 50 percent agreed with the statement whereas 57.1 percent of respondents with a college certificate agreed. 57.1 percent of respondents with a college diploma strongly agreed and 100 percent of respondents with a university undergraduate degree strongly agreed. On average 47.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.61: Highest qualification\* information quality**

Qualification		Information Quality				Total
		Strongly disagree	Disagree	Agree	Strongly agree	
High School Certificate	Count	1	1	12	10	24
	% within Qualification	4.2%	4.2%	50.0%	41.7%	100.0%
College Certificate	Count	0	1	8	5	14
	% within Qualification	0.0%	7.1%	57.1%	35.7%	100.0%
College Diploma	Count	0	0	6	8	14
	% within Qualification	0.0%	0.0%	42.9%	57.1%	100.0%
University Undergraduate Degree	Count	0	0	0	3	3
	% within Qualification	0.0%	0.0%	0.0%	100.0%	100.0%
Total	Count	1	2	26	26	55
	% within Qualification	1.8%	3.6%	47.3%	47.3%	100.0%

Table 5.61 shows that 63.36 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 52.3 percent of those with more than five years'

experience strongly agreed. On average 47.3 percent of respondents from both groups agreed with the statement.

**Table 5.62: Years of experience\* information quality**

			Information Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Years of Experience	1-5 years	Count % within Years of Experience	0 0.0%	1 9.1%	7 63.6%	3 27.3%	11 100.0%
	> 5 years	Count % within Years of Experience	1 2.3%	1 2.3%	19 43.2%	23 52.3%	44 100.0%
Total		Count % within Years of Experience	1 1.8%	2 3.6%	26 47.3%	26 47.3%	55 100.0%

Table 5.63 shows that 47.3 percent respondents using various systems on average agreed with the statement. Respondents who used Pronto ERP, Jigsaw, inflight, Process Control and MS Office had 100 percent strong agreement. Due to the nature of the systems which drive business decisions around key operations and financial areas, the systems were fully tested during implementation and users of the system are able to identify areas of improvement in information quality and act on them.

**Table 5.63: Information system\* information quality**

			Information Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Information System	Modular	Count % within Information System	0 0.0%	1 16.7%	3 50.0%	2 33.3%	6 100.0%
	Intranet	Count % within Information System	0 0.0%	1 5.6%	10 55.6%	7 38.9%	18 100.0%
	Oracle	Count % within Information System	0 0.0%	0 0.0%	6 54.5%	5 45.5%	11 100.0%
	Pronto	Count	0	0	0	4	4

	% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
Graphical Console	Count	1	0	1	1	3
	% within Information System	33.3%	0.0%	33.3%	33.3%	100.0%
MS File Server	Count	0	0	4	1	5
	% within Information System	0.0%	0.0%	80.0%	20.0%	100.0%
Inflight	Count	0	0	0	1	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
Email System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Process Control 7	Count	0	0	0	3	3
	% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
MS Office System	Count	0	0	0	1	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
Jigsaw	Count	0	0	0	1	1
	% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
MinCare	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	1	2	26	26	55
	% within Information System	1.8%	3.6%	47.3%	47.3%	100.0%

## b) System Quality

This section shows general response to section 3 statement 14 where respondents were asked whether the system responds quickly when using it. The question sought to determine system quality of the systems. Next is the detailed presentation of findings which cross tabulated demographic variables and system quality.

Table 5.64 below shows the case processing summary. Two respondents opted out of answering this question. For this reason there was 96.4 percent response rate specifically to this question.



**Table 5.64: System quality case processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * System Quality	54	96.4%	2	3.6%	56	100.0%
Staff Category * System Quality	54	96.4%	2	3.6%	56	100.0%
Department * System Quality	54	96.4%	2	3.6%	56	100.0%
Qualification * System Quality	54	96.4%	2	3.6%	56	100.0%
Years of Experience * System Quality	54	96.4%	2	3.6%	56	100.0%
Information System * System Quality	54	96.4%	2	3.6%	56	100.0%

Table 5.65 below shows the cross tabulation between gender and system quality. 58.7 percent of the males and 50 percent of the females agreed with the statement representing 57.4 percent average agreement on the dimension across male and females.

**Table 5.65: Gender\* system quality**

			System Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Gender	Male	Count	3	5	27	11	46
		% within Gender	6.5%	10.9%	58.7%	23.9%	100.0%
	Female	Count	0	4	4	0	8
		% within Gender	0.0%	50.0%	50.0%	0.0%	100.0%
Total		Count	3	9	31	11	54
		% within Gender	5.6%	16.7%	57.4%	20.4%	100.0%

Table 5.66 below shows that 53.8 percent of junior staff agreed with the statement whereas 66.7 percent of the senior staff strongly agreed. On average, both junior staff and senior staff agreed to the statement at 57.4 percent.

**Table 5.66: Staff category \* system quality**

	System Quality	Total
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			Strongly disagree	Disagree	Agree	Strongly agree	
Staff Category	Junior Staff	Count	3	5	21	10	39
		% within Staff Category	7.7%	12.8%	53.8%	25.6%	100.0%
Senior Staff	Count	0	4	10	1	15	
		% within Staff Category	0.0%	26.7%	66.7%	6.7%	100.0%
Total	Count	3	9	31	11	54	
		% within Staff Category	5.6%	16.7%	57.4%	20.4%	100.0%

Table 5.67 below shows that on average respondents from all the departments agreed with the statement with average 57.4 percent. The highest was in Environment, with 100 percent followed by Human Resources with 75 percent. The information obtained from environment systems impact decision making on license to operate. Further, the information from Human Resources systems e.g Oracle impact payment of salaries and industrial relations. For this reason, the systems used should be of quality and provide timely and accurate information. It is for this reason, the data shows agreement in these specific departments.

**Table 5.67: Department\* system quality**

			System Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Department Mining	Count	2	1	6	1	10	
	% within Department	20.0%	10.0%	60.0%	10.0%	100.0%	
Processing	Count	0	2	7	3	12	
	% within Department	0.0%	16.7%	58.3%	25.0%	100.0%	
Commercial Services	Count	0	3	5	2	10	
	% within Department	0.0%	30.0%	50.0%	20.0%	100.0%	
Technical Services	Count	0	0	4	2	6	
	% within Department	0.0%	0.0%	66.7%	33.3%	100.0%	
Security	Count	1	2	3	2	8	

	% within Department	12.5%	25.0%	37.5%	25.0%	100.0%
Environment	Count	0	0	1	0	1
	% within Department	0.0%	0.0%	100.0%	0.0%	100.0%
Sustainability	Count	0	0	2	1	3
	% within Department	0.0%	0.0%	66.7%	33.3%	100.0%
Human Resources	Count	0	1	3	0	4
	% within Department	0.0%	25.0%	75.0%	0.0%	100.0%
Total	Count	3	9	31	11	54
	% within Department	5.6%	16.7%	57.4%	20.4%	100.0%

Table 5.68 shows that among respondents with high school certificate, 58.3 percent agreed with the statement whereas 61.5 percent of respondents with a college certificate agreed. 50 percent of respondents with a college diploma agreed and 66.7 percent of respondents with a university undergraduate degree agreed. On average 57.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.68: Highest qualification\* system quality**

			System Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Qualification	High School Certificate	Count	2	2	14	6	24
		% within Qualification	8.3%	8.3%	58.3%	25.0%	100.0%
	College Certificate	Count	1	2	8	2	13
		% within Qualification	7.7%	15.4%	61.5%	15.4%	100.0%
	College Diploma	Count	0	5	7	2	14
		% within Qualification	0.0%	35.7%	50.0%	14.3%	100.0%
	University Undergraduate Degree	Count	0	0	2	1	3
		% within Qualification	0.0%	0.0%	66.7%	33.3%	100.0%
Total		Count	3	9	31	11	54

% within Qualification	5.6%	16.7%	57.4%	20.4%	100.0%
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Table 5.69 shows that 60 percent of respondents with 1-5 years working experience at the mine strongly agreed with the statement whereas 59.1 percent of those with more than five years’ experience agreed. On average 57.4 percent of respondents from both groups agreed with the statement.

**Table 5.69: Years of experience\* system quality**

			System Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Years of Experience	1-5 years	Count % within Years of Experience	1 10.0%	2 20.0%	5 50.0%	2 20.0%	10 100.0%
	> 5 years	Count % within Years of Experience	2 4.5%	7 15.9%	26 59.1%	9 20.5%	44 100.0%
Total		Count % within Years of Experience	3 5.6%	9 16.7%	31 57.4%	11 20.4%	54 100.0%

Table 5.70 shows that 57.4 percent respondents using various systems on average agreed with the statement. Respondents who used Inflight, Pronto, Email system, Jigsaw and Mincare which had 100 percent agreement. This can be explained by the fact these systems have adequate training and system support from the vendor

**Table 5.70: Information system\* system quality**

			System Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Information System	Modular	Count % within Information System	0 0.0%	0 0.0%	4 66.7%	2 33.3%	6 100.0%
	Intranet	Count % within Information System	0 0.0%	4 23.5%	10 58.8%	3 17.6%	17 100.0%
Oracle		Count	1	4	4	2	11

	% within Information System	9.1%	36.4%	36.4%	18.2%	100.0%
Pronto	Count	0	0	4	0	4
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Graphical Console	Count	1	0	2	0	3
	% within Information System	33.3%	0.0%	66.7%	0.0%	100.0%
MS File Server	Count	1	1	1	2	5
	% within Information System	20.0%	20.0%	20.0%	40.0%	100.0%
Inflight	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Email System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Process Control 7	Count	0	0	1	2	3
	% within Information System	0.0%	0.0%	33.3%	66.7%	100.0%
MS Office System	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Jigsaw	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
MinCare	Count	0	0	1	0	1
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	3	9	31	11	54
	% within Information System	5.6%	16.7%	57.4%	20.4%	100.0%

### c) Service Quality

This section shows general response to section 3 statement 15 where respondents were asked whether the system support team helps with system problems. The question sought to determine service quality of the systems. Next is the detailed presentation of findings which cross tabulated demographic variables and service quality.

Table 5.71 below shows the case processing summary. Three respondents opted out of answering this question. For this reason there was 94.6 percent response rate specifically to this question.

**Table 5.71: Service quality Case Processing Summary**

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Gender * Service Quality	53	94.6%	3	5.4%	56	100.0%
Staff Category * Service Quality	53	94.6%	3	5.4%	56	100.0%
Department * Service Quality	53	94.6%	3	5.4%	56	100.0%
Qualification * Service Quality	53	94.6%	3	5.4%	56	100.0%
Years of Experience * Service Quality	53	94.6%	3	5.4%	56	100.0%
Information System * Service Quality	53	94.6%	3	5.4%	56	100.0%

Table 5.72 below shows the cross tabulation between gender and service quality. 57.8 percent of the males and 75 percent of the females agreed with the statement representing 60.4 percent average agreement on the dimension across male and females. The mine is relatively new and for this reason, a lot of newer and tested processes and skills are used by the in house information technology team in order to support the systems. Apart from that, support is also offered through group information technology shared service centre.

**Table 5.72: Gender\* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Gender	Male	Count	2	2	26	15	45
		% within Gender	4.4%	4.4%	57.8%	33.3%	100.0%
	Female	Count	0	0	6	2	8
		% within Gender	0.0%	0.0%	75.0%	25.0%	100.0%
Total		Count	2	2	32	17	53
		% within Gender	3.8%	3.8%	60.4%	32.1%	100.0%

Table 5.72 below shows that 60.5 percent of junior staff and 60 percent of the senior staff agreed with the statement. On average, both junior staff and senior staff agreed to the statement at 60.4 percent.

**Table 5.73: Staff category \* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Staff Category	Junior Staff	Count	2	2	23	11	38
		% within Staff Category	5.3%	5.3%	60.5%	28.9%	100.0%
Staff Category	Senior Staff	Count	0	0	9	6	15
		% within Staff Category	0.0%	0.0%	60.0%	40.0%	100.0%
Total		Count	2	2	32	17	53
		% within Staff Category	3.8%	3.8%	60.4%	32.1%	100.0%

Table 5.74 below shows that on average respondents from all the departments agreed with the statement with average 60.4 percent. The highest was Enviroment with 100 percent followed by Human Resources with 75 percent. There are adequate service level agreements with the vendor and in house support team for the information systems in these departments.

**Table 5.74: Department\* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Department	Mining	Count	1	2	4	3	10
		% within Department	10.0%	20.0%	40.0%	30.0%	100.0%
Department	Processing	Count	1	0	8	2	11
		% within Department	9.1%	0.0%	72.7%	18.2%	100.0%
Department	Commercial	Count	0	0	6	4	10

Services	% within Department	0.0%	0.0%	60.0%	40.0%	100.0%
Technical Services	Count	0	0	4	2	6
	% within Department	0.0%	0.0%	66.7%	33.3%	100.0%
Security	Count	0	0	5	3	8
	% within Department	0.0%	0.0%	62.5%	37.5%	100.0%
Environment	Count	0	0	1	0	1
	% within Department	0.0%	0.0%	100.0%	0.0%	100.0%
Sustainability	Count	0	0	1	2	3
	% within Department	0.0%	0.0%	33.3%	66.7%	100.0%
Human Resources	Count	0	0	3	1	4
	% within Department	0.0%	0.0%	75.0%	25.0%	100.0%
Total	Count	2	2	32	17	53
	% within Department	3.8%	3.8%	60.4%	32.1%	100.0%

Table 5.75 shows that among respondents with high school certificate, 60.9 percent agreed with the statement whereas 61.5 percent of respondents with a college certificate agreed. 57.1 percent of respondents with a college diploma agreed and 60.4 percent of respondents with a university undergraduate degree agreed. On average 47.7 percent across all respondents with various qualifications agreed with the statement.

**Table 5.75: Highest qualification\* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Qualification	High School Certificate	Count	2	2	14	5	23
		% within Qualification	8.7%	8.7%	60.9%	21.7%	100.0%
	College Certificate	Count	0	0	8	5	13



	% within Qualification	0.0%	0.0%	61.5%	38.5%	100.0%
College Diploma	Count	0	0	8	6	14
	% within Qualification	0.0%	0.0%	57.1%	42.9%	100.0%
University Undergraduate Degree	Count	0	0	2	1	3
	% within Qualification	0.0%	0.0%	66.7%	33.3%	100.0%
Total	Count	2	2	32	17	53
	% within Qualification	3.8%	3.8%	60.4%	32.1%	100.0%

Table 5.76 shows that 70 percent of respondents with 1-5 years working experience at the mine agreed with the statement whereas 58.1 percent of those with more than five years' experience agreed. On average 60.4 percent of respondents from both groups agreed with the statement.

**Table 5.76: Years of experience\* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Years of Experience	1-5 years	Count	0	0	7	3	10
		% within Years of Experience	0.0%	0.0%	70.0%	30.0%	100.0%
	> 5 years	Count	2	2	25	14	43
		% within Years of Experience	4.7%	4.7%	58.1%	32.6%	100.0%
Total		Count	2	2	32	17	53
		% within Years of Experience	3.8%	3.8%	60.4%	32.1%	100.0%

Table 5.77 shows that 60.4 percent of the respondents using various systems on average agreed with the statement. Respondents who used Inflight, Jigsaw, MS Office and Mincare had 100 percent agreement. There was 100 percent strong agreement for users of email system. This can be explained by the fact that users of these systems are few and there is adequate training support from the vendor.

**Table 5.77: Information system\* service quality**

			Service Quality				Total
			Strongly disagree	Disagree	Agree	Strongly agree	
Information System	Modular	Count	0	0	3	3	6
		% within Information System	0.0%	0.0%	50.0%	50.0%	100.0%
	Intranet	Count	0	1	8	7	16
		% within Information System	0.0%	6.3%	50.0%	43.8%	100.0%
	Oracle	Count	0	1	8	2	11
		% within Information System	0.0%	9.1%	72.7%	18.2%	100.0%
	Pronto	Count	0	0	3	1	4
		% within Information System	0.0%	0.0%	75.0%	25.0%	100.0%
	Graphical Console	Count	1	0	1	1	3
		% within Information System	33.3%	0.0%	33.3%	33.3%	100.0%
	MS File Server	Count	0	0	3	2	5
		% within Information System	0.0%	0.0%	60.0%	40.0%	100.0%
	Inflight	Count	0	0	1	0	1
		% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
	Email System	Count	0	0	0	1	1
		% within Information System	0.0%	0.0%	0.0%	100.0%	100.0%
Process Control 7	Count	1	0	2	0	3	
	% within Information System	33.3%	0.0%	66.7%	0.0%	100.0%	
MS Office System	Count	0	0	1	0	1	
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%	
Jigsaw	Count	0	0	1	0	1	
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%	
MinCare	Count	0	0	1	0	1	
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%	

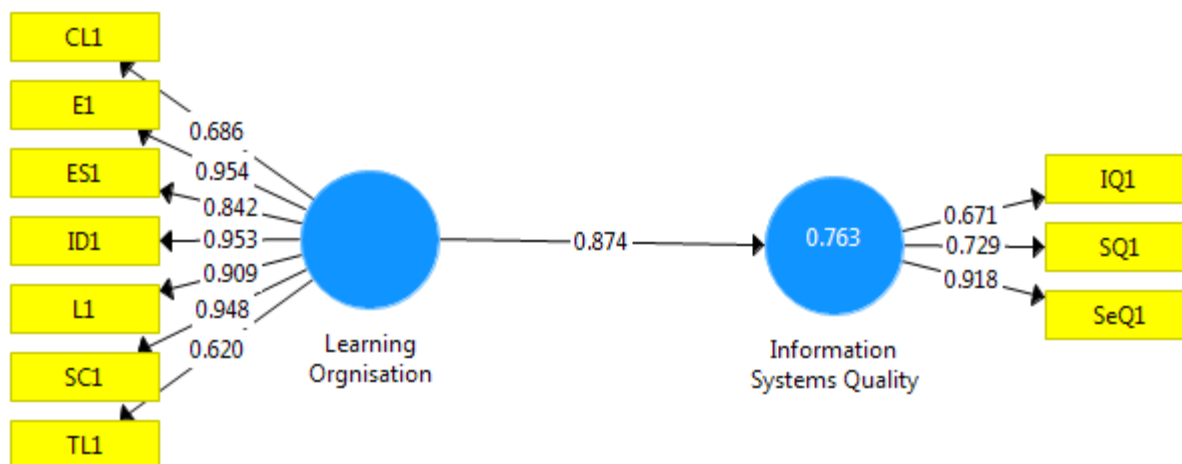
	% within Information System	0.0%	0.0%	100.0%	0.0%	100.0%
Total	Count	2	2	32	17	53
	% within Information System	3.8%	3.8%	60.4%	32.1%	100.0%

### 5.3 Research Model Testing and Analysis

In the research model, learning organisation is an independent variable whereas information system quality is a dependent variable. These latent variables making up the model were first tested for reliability and validity. Next, the hypotheses in the research model were tested using partial least squares structural equation modelling (PLS-SEM). There are two measurement scales in SEM, namely formative and reflective. In this research, a reflective measurement scale was used because the indicators are highly correlated and interchangeable. For example, the latent variable information systems quality has indicators: information quality, system quality and service quality. These indicators are correlated. In a reflective measurement scale, the causality direction goes from the blue-colour latent variable to the yellow-color indicators.<sup>282</sup> The researcher calculated the path modelling using PLS algorithm in SmartPLS and used case wise deletion for missing values. Hari et al<sup>283</sup> explained case wise deletion as a method of treating missing values in SmartPLS which deletes each row that contains missing value, only leaving the remaining data for computations. Figure 5.1 below shows the PLS-SEM results.

282 Wong, K.K. 2013. Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. *Marketing Bulletin*, 2013, 24, Technical Note 1.

283 Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. 2014. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage: Thousand Oaks.

**Figure 5.1: PLS-SEM results**

Based on Figure 5.1, the following are some preliminary observations.

#### *Target endogenous variable Variance*

Coefficient of determination,  $R^2$ , is 0.763 for information systems quality endogenous latent variable. This means that the latent variable, learning organisation substantially explains 76.3percent of the variance in information systems quality.

#### *Inner model path coefficient sizes and significance*

The inner model suggests that learning organisation has an effect of 0.874 on information systems quality. For this reason, the hypothesised path relationship between learning organisation and information systems quality is statistically significant.

#### *Outer model loadings*

The loadings showed the correlations between the latent variable and the indicators. The table 5.9 that follows shows all the loadings.

**Table 5.78: Outer loadings**

<i>Latent Variable</i>	<i>Indicators</i>	<i>Loadings</i>
Learning organisation Culture	CL1	0.686
	ID1	0.953
	TL1	0.620
	ES1	0.842
	SC1	0.948
	E1	0.954
	L1	0.909
Information Systems Quality	IQ1	0.671
	SQ1	0.729
	SeQ1	0.918

#### 5.4 Reliability and Validity Testing

The latent variables in the research model were tested for reliability and validity. Below are the findings.

##### *Reliability*

The researcher started with indicator reliability where the outer loadings were checked. These were squared to find the indicator reliability values. The minimum acceptable level is 0.4 and the preferred is above 0.7. The results were above 0.4 and this confirmed that the indicator reliability was passed. Next was the internal consistency reliability where the reliability numbers were checked. Since they were approximate equal or above 0.4, this test was passed as well. As per the observation by Hair et al<sup>284</sup>, the composite reliability was used as a replacement for Cronbach's alpha which is sometimes used for internal consistency reliability. Table 5.10 below shows the values for reliability testing results.

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284 Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. 2014. A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), Sage: Thousand Oaks.

**Table 5.79: Summary of reliability test results<sup>285</sup>**

Latent Variable	Indicators	Loadings	Indicator reliability(i.e loadings squared)	Composite Reliability	AVE
Learning organisation Culture	CL1	0.686	0.470596	0.9487	0.7299
	ID1	0.953	0.908209		
	TL1	0.620	0.3844		
	ES1	0.842	0.708964		
	SC1	0.948	0.898704		
	E1	0.954	0.910116		
	L1	0.909	0.826281		
Information Systems Quality	IQ1	0.671	0.450241	0.8208	0.6087
	SQ1	0.729	0.531441		
	SeQ1	0.918	0.842724		

As can be seen in the Table 5.10, the indicator reliability values for all individual indicators are above the minimum acceptable level of 0.4 and close to the preferred level of 0.7. This means that the model has passed the reliability test.

### *Validity*

The validation process involved use of convergent and discriminant validity. Firstly, the convergent validity, involved the use of an average variance extracted (AVE) number. As suggested by Bagozzi and Yi<sup>286</sup>, any value of AVE above 0.5 means the test has been passed. As can be seen from Table 5.10, the AVE values are above the acceptable minimum of 0.5 and hence the convergent validity was confirmed. Next was the use of AVE numbers and latent variable correlations to test for discriminant validity. As suggested by Fornell and Larcker<sup>287</sup>, the square root of AVE of each latent variable should be greater than the correlations among the latent variables. Table 5.11 below shows values for discriminant validity testing using the Fornell-Larcker criterion.

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285 Wong, K.K. 2013. Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. Marketing Bulletin, 2013, 24, Technical Note 1.

286 Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. Journal of the Academy of Marketing Science, 16(1), 74-94.

287 Fornell, C., & Larcker, D.F., (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18 (1), 39-50.

**Table 5.80: Summary of Fornell-Larcker test results**

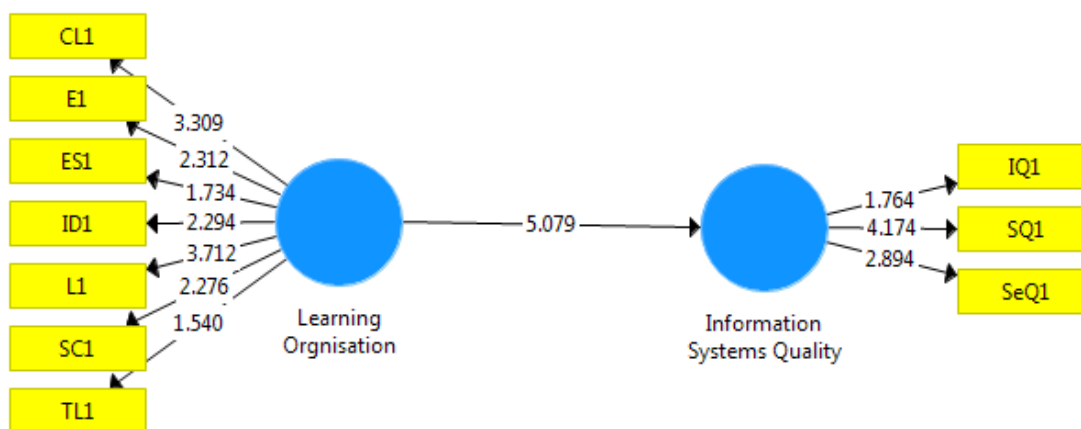
	<i>Learning Organisation Culture</i>	<i>Information Systems Quality</i>
Learning organisation Culture	<b>0.92</b>	0.25
Information Systems Quality	0.35	<b>0.91</b>

The square root of AVE is manually calculated and written in bold on the diagonal of the table. Since the latent variable learning organisation culture’s AVE was found to be 0.8556, then its square root is 0.92. Further examination of the information systems latent variable of which the AVE is 0.8546, and square root is 0.91 was done. The result indicates that indiscrimination validity is well established.

### 5.5 Testing Hypotheses

The bootstrap procedure was used in SmartPLS to test the significance of the structural path using T-statistics. The test was carried out on both the inner and outer model. As discussed by Wong<sup>288</sup> during this process, “the large subsample e.g 5000 are taken from the original sample with replacement to give bootstrap standard errors. This in turn gives approximate T-values for significance testing. The result of this bootstrap procedure are approximates normality of data”. At the end of this procedure, different path coefficients were indicated on the model as shown in Figure 5.2 below.

**Figure 5.2: Research model with t-Statistics of path coefficient**



288 Wong, K.K. 2013. Partial Least Squares Structural Equation Modeling (PLS-SEM) Techniques Using SmartPLS. Marketing Bulletin, 2013, 24, Technical Note 1.

In assessing whether the path coefficient is significant, a two tailed t-test was used with a significant level of five percent. Any path coefficient for which the t-statistics were larger than 1.96 was significant.

The next model to check for t-statistic was the outer model for which the path coefficients are indicated on table 5.12 below.

**Table 5.81: T-statistics of path coefficient (Outer loadings)**

	<i>Learning Organisation</i>	<i>Information Systems Quality</i>
CL1	3.088	
ID1	2.889	
TL1	1.397	
ES1	2.132	
SC1	2.859	
E1	2.985	
L1	4.313	
IQ1		1.574
SQ1		3.839
SeQ1		3.425

As can be seen in the Table 5.13 below, the learning organisation → information systems quality linkage has 6.593 hence it is statistically significant and the null hypothesis, (no association) research hypothesis that states that the overall learning organisation culture does not positively impact information systems quality is rejected. For this reason it can be stated that learning organisation culture has a positive impact on information systems quality, at Lumwana mine which is situated in rural Zambia and has the majority workforce using information systems recruited from the traditional environment.

**Table 5.82: T-statistics of path Coefficient (Inner Model)**

	<b>T-Statistics</b>
Learning organisation culture --->Information Systems quality	6.593

## 5.6 Conclusion

Prior to this research study, learning organisation and information systems quality research had been done in developed countries. This research has extended the discussion by empirically showing that a learning organisation positively impacts information systems



quality, in one mining industry in deep rural Africa. Furthermore, it provides evidence of continuous learning which takes place in such environments when people with little or no computer knowledge adapt to various technologies.

This chapter has discussed the data analysis findings by presenting graphs, pie charts and tables for various variables. It has further tested for reliability and validity of the research model. A structural equation modelling technique using partial least squares was used to test hypotheses. Through these tests, it was found that the secondary hypotheses for the research model were supported and for this reason, the main hypotheses were supported. It was therefore concluded that a learning organisation culture positively impacts information systems quality.

## *Chapter 6*

# Research Implications and Applications

### **6.1 Introduction**

The previous chapter discussed the research data analysis and findings. Whilst similar research has focused on the context of more developed countries, this research focused on Lumwana mine in particular which is situated in deep rural Africa. In this research, the objectives were to gain a better understanding by reviewing primary and secondary resources about the Lumwana society and internal Lumwana mine systems and processes. Before conducting the survey, it was hypothesised that a learning organisation culture positively impacts information systems quality. The survey responses across learning organisation and information systems quality variables identified that a learning organisation culture in a traditional context positively impacts information systems quality. This was empirically tested using data from a case study of Lumwana Mine. In this chapter, the research implications, applications, theoretical contribution and opportunities for further research are discussed and lastly a conclusion is provided.

### **6.2 Implications and Applications of Learning Organisation and Information System Quality Findings**

Through this research and the presentation of findings in graphs, tables, pie charts and the structural equation modelling in SmartPLS, the implications and application of a learning organisation culture on information systems quality is discussed taking a view of what government and company policies can support such processes. Learning organisation culture

dimensions such as continuous learning, team learning, embedded system, empowerment, system connection, leadership, inquiry and dialogue have been known to be good indicators of learning organisation culture. This is evident from many incidents where the respondents selected agree or strongly agree in the questionnaire of which the results were presented in tables and bar charts in Chapter 5. This is also confirmed by the loadings of 0.686 for continuous learning, 0.620 for team learning, 0.842 for embedded system, 0.954 for empowerment, 0.948 for system connection, 0.909 for leadership, 0.953 for inquiry and dialogue on the structural equation model Figure 5.1.

Organisation management should not overlook these basic elements of day-to-day operation because it has been shown that a learning organisation significantly influences information systems quality in terms of information quality, system quality and service quality which is key to decision making.

As reviewed by the case study for Lumwana society, which is an example of deep rural Africa, the vast areas are not adequately developed. The majority of the Lumwana area is a traditional society. As discussed previously, Rostow<sup>289</sup> defined the traditional society as the first stage of development where agriculture using traditional means is what is normally done by most of the population for economic means. However, evidence from this research indicates that the people in such societies can still learn and adopt information technologies when some development has taken place in their environment and they get employed in organisation settings where a learning organisation culture exists and there are information systems individuals perceive to be useful and to have perceived ease of use. The establishment of Lumwana Mining Company which started operations in 2008 signified the preconditions for take-off stage as per the Rostow<sup>290</sup> development model. The development of the mine has been a huge investment and has initiated a changing development. UkZambians<sup>291</sup> reported that the Lumwana society in Solwezi in North-Western Province used to be a greenfield with a few villages dotted around but by 2010 had become a home to a billion dollar mining investment with thousands of inhabitants benefitting from the investment. The result has been industrialisation in the actual Lumwana mining area and transformation of agriculture, education and local finance in the society due to the community

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289 Rostow, W.W., 1960, Stages of economic growth: a non-communist manifesto. Cambridge U.P.

290 Rostow, W.W., 1960, Stages of economic growth: a non-communist manifesto. Cambridge U.P.

291 Ukzambians, 2010. 'Zambia: MFEZ to make Lumwana world-class business hub'.

<http://ukzambians.co.uk/home/2010/10/06/zambia-mfez-lumwana-world-class-business-hub/> Accessed on 18/09/2015

relations programmes by Lumwana mine.

The evidence from this research at Lumwana mine indicates that both the organisation and the government have a major role to play in the skill development of Lumwana society which is witnessing fast industrialisation with latest technologies. The researcher recommends that the government in Zambia should step up a vocational training centre in Kalumbila district where Lumwana mine is located. This will provide skill development opportunities for members of the community and impact on the quality of human resources employed not only at Lumwana mine but other industries that will employ such individuals. Consideration should be made to a private public partnership model where mining houses and the government provide resources and support to the set up and management of the vocational training institute. Since they are two major mining companies in Kalumbila district, Lumwana mine and Kalumbila mine, both mining houses should consider putting a joint effort to the development of such skill development programmes as both employ from the same society which has the same developmental challenges. According to Barrick beyond Borders<sup>292</sup> the challenges of the rural community such as Lumwana include schools being overcrowded, and many students are forced to travel to schools as far as 400 kilometres away and they live on their own in densely populated shanty towns with no electricity and poor sanitation.

Lastly but not the least on the model of developing and managing vocational training, the community should be a stakeholder of the partnership. Lusaka Times<sup>293</sup> reported that Lumwana Mining Company (LMC) had set aside US\$400,000 in the 2015 budget for all its infrastructure community projects to be implemented in Senior Chief Mukumbi and chiefs Mumena and Matebo's chiefdoms in the newly-created Kalumbila district through the Lumwana Community Trust which is aimed at infrastructure development, agriculture support and business support. It was explained by Lusaka Times<sup>294</sup> that the Lumwana Community Trust was part of the obligations agreed in the memorandum of understanding

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292 Barrick Gold Corporation | Beyond borders, 2013. Overcoming Barriers To Education In Zambia'. <http://barrickbeyondborders.com/people/2013/11/overcoming-barriers-to-education-in-zambia/> Accessed on 18/09/2015

293 Lusaka Times, 2015. 'Lumwana Mine Pumps \$ 400,000 into Social Development Project'. <https://www.lusakatimes.com/2015/09/16/lumwana-mine-pumps-400-000-into-social-development-projects/> Accessed on 18/09/2015

294 Lusaka Times, 2015. 'Lumwana Mine Pumps \$ 400,000 into Social Development Project'. <https://www.lusakatimes.com/2015/09/16/lumwana-mine-pumps-400-000-into-social-development-projects/> Accessed on 18/09/2015

signed in August 2005 between the three chiefs and Lumwana Mine.

The evidence of this research shows less participation of females in employment opportunities even though they showed willingness for continuous learning. Despite the company providing equal opportunities to both males and females, most women have traditionally been marginalised to participate in male dominated tasks. The government should promote female participation through adequate sensitisation of communities and through the Lumwana society political system to help with acceptance of gender equity.

In order to ensure the skill development effort is relevant to the needs of the mines in Kalumbila district, the development of programmes for skill development should take into consideration the challenges or needs of individuals recruited from Lumwana society, the available advanced technology in the mining companies and the labour market in Zambia and beyond.

The take-off stage of development has slowly started happening in Lumwana society. As noted in the theoretical background, the researcher mentioned that Rostow<sup>295</sup>, discussed that in this stage a society experiences several modifications. Lumwana society has seen huge growth and development of the local economy due to the mining sector which has seen the rise in the employment of capital in agriculture, the need for extrinsic finances and a limited amount of development in savings and investments. The Lumwana society has seen rapid growth because of political or technological motivation. Over the years, the main emphasis of this phase has been on self-sustained development. It is the opinion of the researcher that the Lumwana society is slowly entering this stage. The Lumwana Multi-facility Economic Zone (MEZ) was gazetted by the government of the republic of Zambia to ensure Lumwana society is not dependent on the mine but becomes self-sustaining. The Lusaka Times<sup>296</sup> reported that the government of the republic of Zambia indicated that they would spend about US\$ 1.2 billion on the Lumwana MFEZ. Lumwana MFEZ will have manufacturing and agro-processing companies among others and 90 companies will invest in the project. Ministry of Commerce<sup>297</sup> revealed that the Lumwana MFEZ focus would be on light and heavy

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295 Rostow, W.W., 1960, Stages of economic growth: a non-communist manifesto. Cambridge U.P.

296 Lusaka Times, 2009. 'US\$ 1.2 billion budgeted for Lumwana Multi-Facility Economic Zone'. <https://www.lusakatimes.com/2009/11/17/us-1-2-billion-budgeted-for-lumwana-multi-facility-economic-zone/> Accessed on 18/09/2015

297 Ministry of Commerce, Trade and Industry, 2015. 'Status on the Development of MFEZs/Industrial Parks'. <http://www.mcti.gov.zm/index.php/investing-in-zambia/multifacility-economic-zones/86-status-on-the-development-of-mfezsindustrial-parks-> Accessed on 18/09/2015

industries. Some notable activities that the MFEZ will house include: - manufacture of explosives, agro processing, horticulture, fisheries, and hotel accommodation, among others.

Having discussed the development stages that the Lumwana society has undergone following the development of a world class mining company in the area, the researcher takes the perspective of technology acceptance as part the learning that has taken place in such an environment and how this can be enhanced through good government and company policies.

In this research, there is evidence that employees are required to know the systems as a key part of their work. Job performance is evaluated based on how well they learn successfully the use of business information system in their area. For example, operators in the mining section use the modular system for fleet monitoring and graphical console for truck navigation system. This is part of their day-to-day work and specific key performance indicators are employed to determine how this is being used as part of production reporting and fleet optimisation. The second factor is the perceived ease of use which Davis is the extent to which the likely user anticipates the target system to be easy. <sup>298</sup>

The follow-up interviews indicated that the systems being used have interfaces that can be used by an average computer user. As most of the work involves data entry, data management and recognition of specific flags, they are refresher training for operators so that they get used to the system. For example, for the Graphic Console system, the operators were trained using simulators with full supervision by the expert instructors. The perceived use factor is a more dominant reason for most of the operator's acceptance of the technology in their operational area. The successful learning of the system is critical for fleet operations and the know-how for the system is a determinant factor as to whether an individual is qualified to work in the fleet crews or not. Some information systems such as the Intranet did form part of the compulsory systems for some sections such as mining. However the perceived ease of use and need to access and review policies, procedures and standards, collaborate through discussion boards and read companywide announcements, resulted in a number of users frequently using the Intranet. They agreed that the system was easy to learn, responded quickly and produced the required information.

Information quality in decision making is complemented by system and service quality. For this reason, the organisation should continue implementing best practices in information

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298 Davis, F.D. 1989, "Perceived usefulness, perceived ease of use, and user acceptance of information technology", *MIS Quarterly*, Vol. 13 No. 3, pp. 319-40.

technology provision. The service level agreements and support models that add value to the system and service quality should continue to be prioritised. Whilst they are world best practices around information technology service management which emphasise quality such as ITIL, ITSM, COBIT, Prince 2 etc, these processes should be customised taking into consideration the unique set up of a mine such as Lumwana. The development of local staff to support these systems is another important aspect to help localisation of best practices and easier knowledge transfer.

Learning has been an important aspect of adopting of information systems. This is explained in the improved education levels that have taken place as evidenced through a comparison of these research findings and baseline data before the establishment of the mine. That research study by Kapwepwe et al <sup>299</sup> revealed that an overwhelming majority of 3,345(84%) of the total 3,984 respondents in the research had never been through formal education. Of the 3,984 respondents, 385(9.7%) indicated that they had reached between grades 1 to7 while only 4.2 percent reached grades 8 or 9. Only 54(1.4%) of the respondents had reached between grades 10 to 12. None indicated that they had been to University. However, this research on the sample of 100 at Lumwana mine for the workforce recruited from Lumwana society showed that the majority of the respondents had at least a Grade 12 certificate, representing 43.64 percent, whilst 27.27 percent had a college certificate, 23.64 percent had a college diploma and 5.45 percent had a university degree. This shows improvement and confirms that there has been continuous learning happening among the employees recruited from Lumwana society.

Technology adoption is key to development of 21<sup>st</sup> century information workers. The Ministry of Education in Zambia has introduced a compulsory Information Communication Technology (ICT) curriculum for all primary and secondary schools. This is a good policy in the right direction and will support the efforts by companies like Lumwana mine who have advanced information systems and needs employees at all levels to have the technology know how. Most Schools in rural areas like Lumwana mine are not connected to the power grid and should consider use of solar power for their computer laboratories. Through the vocational training centres, training of school teachers and supporting of computer laboratories should be done. As most of the schools may not afford purchase of computers, the government should consider zero tax on importation of computers and also invite the private sector to

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299 Kapwepwe M, Kaimfa P, Chandang'oma & Victor H. 2007. Lumwana Copper Project, Social Sustainability Impact Assessment and Baseline Study

consider as part of their disposal of computers to donate the good working ones with useful life to the schools.

The research underpins the importance of organisations to act as agents of knowledge transfer which contributes to the wellbeing of society whilst they gain competitive advantage by having learning organisation processes, capable of transferring knowledge about advanced information systems. Evidence through follow up interviews suggested that the use of information systems is mostly for operational purposes. The understanding and use of information for strategic purposes requires a high level of interpretation skills and specialised training in fields such as business intelligence. This includes the knowledge of score cards, key performance indicators (KPIs), data mining models for forecasting and trend analysis, dashboards, drill in and drill out.

### **6.3 Theoretical Contributions**

This study has contributed to the emerging field of the learning organisation by proving that a learning organisation culture positively impacts information systems quality. Further, the data analysis has contributed empirical results in support of the field from Lumwana mining company which is situated in deep rural Africa. The other theoretical contribution has been the validation of elements of the DLOQ in an African rural context. Further, the research model has expanded the D & M IS Success Model by adding learning organisation culture variables that positively impacts on information, system and service quality measures.

### **6.4 Recommendation For Further Research**

Future research should consider the examination of linkages between a learning organisation and information systems in an African rural context in general and particularly in sectors such as agriculture and tourism. Such studies would benefit the field as the cultural settings in rural Africa will bring a diversity of results to the field. Whilst a mixed methodology was used in this research, future studies should consider using other methodologies as well.

### **6.5 Conclusion**

Throughout this research it became clear that, when an opportunity is presented to individuals, teams and organisations, learning about information systems is a continuous process that can occur in different contexts, including traditional set ups which are under. This type of learning and use of information systems can be called first level learning as it does not require specialised knowledge. The author categorises the second level of learning as one which requires use of knowledge to interpret the information and make decisions. The



research brings evidence in this aspect by follow-up interviews that were conducted showing that end users who had attained diploma and degree in their studies, had good use and interpretation skills of the information coming from the system compared to those who had a grade 12 certificate only.

For technology acceptance and eventual information systems quality, as argued by other researchers such as Davis, the fact that the individuals knew that as part of their job, they needed to know the system, resulted in a drive to learn it. The research has further provided evidence that in-house developed systems such as the Intranet had a fairly high number of users with high scores. Follow up interviews indicated that, the in house system was widely accessible compared to other systems that had restricted access. Further, the support team conducted a lot of user adoption training which made the system users feel comfortable.

Though the research yielded positive results, there were limitations. As the target industry was mining, it cannot be generalised that these results can be obtained in other sectors in the rural areas.

The case study of Lumwana mine is another success story of how organisation level policy on a learning organisation can contribute to competitive advantage through better information systems quality which results in better decision making.

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